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**PROPOSED REVISIONS TO THE SECTIONS OF THE
REGULATIONS FOR CONSTRUCTION PROJECTS,
INDUSTRIAL ESTABLISHMENTS, AND MINES
AND MINING PLANTS, WHICH ADDRESS ELECTRICAL HAZARDS
EXPLANATORY NOTES**

**MINISTRY OF LABOUR
OCCUPATIONAL HEALTH & SAFETY DIVISION**

OCTOBER 1986

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TABLE OF CONTENTS

PROPOSED REVISIONS TO THE SECTIONS OF THE REGULATIONS FOR CONSTRUCTION PROJECTS, INDUSTRIAL ESTABLISHMENTS, AND MINES AND MINING PLANTS, WHICH ADDRESS ELECTRICAL HAZARDS

EXPLANATORY NOTES

	Page
Purpose of these Notes	1
Background	1
An Overview of the Proposed Revised Regulations	3
Proposed Revisions to the Regulations for Construction Projects, in Detail	5 (C1)
Clause 17(2) (f) Entrance to Room with Live Parts	17 (C13)
Clause 68(c) Tools Near Live Conductor	16 (C12)
Section 100 Electrical Equipment and Installations	5 (C1)
Sections 101 Panel Boards and Switches	18 (C14)
Section 102 Panel Boards and Switches	18 (C14)
Section 103 Equipment Grounding	20 (C16)
Subsection 104 (1) Lock-out	12 (C8)
Subsection 104 (2) Live Work	14 (C10)
Section 105 Work in Proximity to Overhead Conductors	9 (C5)
Subsection 119 (8) Electrical Hazard in Confined Spaces	25 (C21)
Subsection 186 (2) Cables in Tunnels and Shafts	22 (C18)
Section 198 Ground Fault in Tunnels and Shafts	23 (C19)
Section 199 Equipment Grounding	20 (C16)
New Section Equipment No Longer Used	24 (C20)
New Section Ground Fault	21 (C17)
New Section Reasonable Precaution	8 (C4)
New Section Temporary Installations/Lighting	7 (C3)
New Part Electrical Utility Work	26 (C22)
 Proposed Revisions to the Regulations for Industrial Establishments, in Detail	 30 (I1)
Section 44 Electrical Equipment and Installations	30 (I1)
Section 45 Entrance into Room with Live Parts	39 (I10)
Subsection 46 (1) Lock-out	34 (I5)
Subsections 46 (2) & (3) Live Work	36 (I7)
Section 47 Tools Near Live Conductor	38 (I9)
Section 48 Equipment Grounding	40 (I11)
Section 64 Work in Proximity to Overhead Conductors	31 (I2)
New Section Ground Fault	41 (I12)
New Section Equipment No Longer Used	42 (I13)
New Section Electrical Utility Work	43 (I14)

	Page
Proposed Revisions to the Regulations for Mines & Mining Plants in Detail	45 (M1)
Subsections 148 (1) & (2)	45 (M1)
Subsections 148 (3)	47 (M3)
Subsection 148 (4)	48 (M4)
Section 149	65 (M21)
Section 150	64 (M20)
Section 151	49 (M5)
Subsection 152 (1)	56 (M12)
Subsections 152 (2), (3) and (5)	50 (M6)
Subsection 152 (4)	66 (M22)
Section 153	54 (M10)
Section 154	58 (M14)
Section 155*	61 (M17)
Section 156*	
Section 157	60 (M16)
Section 158	67 (M23)
Section 159	69 (M25)
Section 160	70 (M26)
Section 161	71 (M27)
Section 162	72 (M28)
Section 163*	73 (M29)
Section 164*	
Subsection 165 (1)*	
Subsection 165 (2)	59 (M15)
Subsection 165 (3)	
Subsection 166 (1), (2) & (3) (a)	45 (M1)
Subsection 166 (3)(b)*	
Subsection 166 (4)*	
Section 167*	
Section 168	62 (M18)
Section 169	74 (M30)
Section 170	75 (M31)
Section 171	76 (M32)
Section 172	77 (M33)
Section 173	78 (M34)
New Section	79 (M35)

* Although located in "Part VII; Electrical", this section or sub-section was not reviewed as it does not relate to an electrical hazard.

	Page
Appendix I. Proposed revisions to regulations addressing electrical hazards - A comparison between Construction, Industrial and Mining Regulations.	81
Electrical Equipment and Installations	82
Liquid in Electrical Equipment	84
Competent Person Appointed	85
Temporary Installations/Lighting	86
Reasonable Precautions	87
Work in Proximity to Overhead Conductors	88
Lock-Out	92
Live Work	94
Tools near Live Conductor	96
Entrance to Room with Live Parts	97
Panel Boards and Switches	98
Equipment Grounding	100
Ground Fault	101
Cables for Tunnels and Shafts	102
Ground Fault in Tunnels and Shafts	104
Equipment No Longer Used	105
Notification of Electrical Installations	106
Guarding of Electrical Equipment	107
Cable for Electric Mobile Equipment	108
Testing of Protective Devices	109
Single Pole Disconnect	110
Knife Switches	111
Disconnect	112
Motor Disconnect	112
Grounding Conductor	113
Junction Boxes	114
Telephone Cables	115
Underground Lighting Circuit	116
Underground Trolley Lines	117
Electrical Utility Work	118

**PROPOSED REVISIONS TO THE SECTIONS OF THE REGULATIONS
FOR CONSTRUCTION PROJECTS, INDUSTRIAL ESTABLISHMENTS,
AND MINES AND MINING PLANTS, WHICH ADDRESS
ELECTRICAL HAZARDS**

EXPLANATORY NOTES

Purpose of these Notes

These explanatory notes are intended to assist the reader in understanding the proposed revisions to the sections of the Regulations for Construction Projects, Industrial Establishments and Mines and Mining Plants which address electrical hazards. The notes also highlight the main features of the proposed revisions and the rationale for those revisions. These notes are not an exhaustive description of the proposed revised regulations, nor are they to be considered a legal interpretation of their provisions.

Background

Workers' Compensation Board records show that in the past decade, there was an average of 8 fatal electrocutions and 190 non-fatal electrical accidents per year in the Construction, Industrial and Mining Sectors.

The Regulations for Construction Projects, the Regulations for Industrial Establishments and the Regulations for Mines and Mining Plants, made under the Occupational Health and Safety Act, (the Act), all address electrical hazards.

The wording, and in some cases the intent, of a number of sections on electrical hazards, differs between the three regulations. Depending on the circumstances and location, the work carried out by a municipal electrical utility may be inspected as:

- a construction project under the Construction Regulations,
- an industrial establishment under the Industrial Regulations,
- an "extended coverage place", i.e., a work place subject to the Act but for which regulations have yet to be promulgated. In such a case, either the Construction or the Industrial Regulations may be cited as guidelines for reasonable precautions that an employer must take under s. 14 of the Act.
- a mining plant, or a surface mine under the Mining Regulations.

The Ontario Municipal Electric Association (OMEA) expressed their concern to the Minister of Labour about perceived inconsistencies in the application of the Act and the question of whether the Industrial or Construction Regulations apply to specific activities. In order to address these concerns, various meetings were held in 1983 between Ministry of Labour officials and representatives of the OMEA, the Electrical Utilities Safety Association of Ontario (EUSA), the Association of Municipal Electrical Utilities (AMEU), the International Brotherhood of Electrical Workers (IBEW), and the Canadian Union of Public Employees (CUPE). On May 30, 1984, the

Executive Director, Occupational Health and Safety Division, wrote to the interested parties with a proposed interim resolution of jurisdictional issues.

A ministerial task force was struck in December 1983 to review the Construction, Industrial and Mining Regulations addressing electrical hazards to achieve uniformity. The task force conducted the review with the following objectives:

1. protection of the worker from electrical shock and burn
2. regulations which can be easily understood by workers and inspectors
3. enforceable legislation
4. consistent legislation across the Division, wherever feasible.

On February 14, 1985, the task force presented its report on the Consolidation of Regulations Addressing Electrical Hazards to the Occupational Health and Safety Division Legislative Review Committee. The Committee endorsed the task force's report but required that further work be carried out:

- to develop explanatory notes that would assist interested parties in reviewing this complex matter and in making effective comments on the proposed regulations, and
- to have the proposed regulations reviewed within the Ministry for legal accuracy.

A number of complex technical and legal issues were raised during that process. On May 8, 1985, the proposed regulations were forwarded to Legislative Counsel for review. In July 1985, the task force finished the draft explanatory notes. The dialogue between the task force and Legislative Counsel continued during the summer.

On September 27, 1985, the task force submitted the Explanatory Notes, including proposed regulations as reviewed by Legislative Counsel, to the Executive Director of the Occupational Health and Safety Division. After review, the Executive Director convened in January and February 1986 three separate meetings with EUSA and MEA*, IBEW and Ontario Hydro, asking for preliminary comments on the draft regulations. The Task Force revised the proposed regulations taking those comments into consideration and on September 10, 1986, presented its revised report and regulations to the Occupational Health and Safety Division Legislative Review Committee. After further review, the Executive Director recommended to the Minister that the Explanatory Notes and Proposed Regulations be distributed to interested parties for comments.

* The Municipal Electric Association represents both the OMEA and the AMEU which merged into the new group as of March 1986.

An Overview of the Proposed Revised Regulations

In its review, the task force recognized that three broad categories of electrical hazards must be addressed:

1. electrical installations
2. electrical equipment
3. working procedures

and dealt with them as follows:

1. Electrical Installations

The Electrical Safety Code made under the Power Corporation Act is enforced by Ontario Hydro and applies to the Construction and Industrial Sectors. The Electrical Safety Code incorporates Part I of the Canadian Electrical Code (CEC) of the Canadian Standards Association (CSA) that addresses electrical installation hazards.

In the Mining Sector, installations are often underground. Mining companies must arrange for electrical installations inspectors to go underground, and for safety reasons, accompany them, which may be time consuming and costly. The same applies to inspectors for electrical equipment and working procedures. To simplify matters both types of inspections have been done by what is now called the Ministry of Labour Mining Health and Safety Branch. Due to its experience and intimate knowledge of mines, the Mining Inspectorate has acquired a unique expertise in the special installations and equipment used in mining. Consequently, the Electrical Safety Code (enforced by Ontario Hydro) specifically excludes the Mining Sector. However, the Mining Regulations incorporate Part I of the Canadian Electrical Code.

The CEC Part I is thus applicable to all three sectors, but it is enforced by the Mining Inspectorate in the Mining Sector and by Ontario Hydro in the Construction and Industrial Sectors.

The proposed regulations stipulate general performance standards requirements for the Construction and Industrial Sectors. In addition, the Construction Regulations will require that electrical work be done by a certified electrician or equivalent. It is not proposed that the Electrical Safety Code be incorporated in the Construction and Industrial Regulations as this would obligate Ministry inspectorate for these sectors to duplicate the inspection department of Ontario Hydro. Enforcement of standards on electrical installations in the Construction and Industrial Sectors falls primarily under Ontario Hydro. Where deviations are observed by Ministry inspectors, Ontario Hydro may be notified. Where there is a hazard to the worker, orders may be issued under the appropriate section of the regulations addressing electrical hazards.

2. Electrical Equipment

The three proposed regulations stipulate general performance standards for electrical equipment, i.e., that it would be "suitable for its use". In addition, the Construction Regulations will require that "reasonable precautions" be taken to prevent danger to a worker from electrical equipment.

The Mining Regulations will require equipment certification, either by CSA or Ontario Hydro or an engineer of the Ministry. CSA certification is based on approximately 200 equipment standards which form Part II of the Canadian Electrical Code. Enforcement of certification in the Construction and Industrial Sectors falls primarily under Ontario Hydro. Where deviations are observed by Ministry inspectors, Ontario Hydro may be notified. Where there is a hazard to the worker, orders may be issued under the appropriate section of the regulations addressing electrical hazards.

3. Working Procedures

Working procedures are not covered by the Canadian Electrical Code nor the Electrical Safety Code and are addressed by the proposed specific sections in the Construction, Industrial, and Mining Regulations. Existing sections in the three regulations were regrouped by hazard and reviewed in terms of the Task Force objectives.

The electrical installations and equipment are dealt with in the first sections for the Construction, Industrial and Mining sectors. Other sections deal primarily with working procedures. Whenever possible, requirements were stated in terms of performance standards rather than detailed specification standards.

The objective of consistent legislation across the three sectors is achieved in a number of key areas such as work in proximity to overhead conductors, lock-out, live work, tools near live conductors, entrance to room with live parts and work in confined spaces. The remaining differences are due to the special needs of construction and to the fact that, as previously mentioned, Ontario Hydro's jurisdiction does not extend to mines and the fact that some equipment and hazards are specific to one sector only.

This is best illustrated by Appendix I, "Proposed revisions to regulations addressing electrical hazards - A comparison between Construction, Industrial and Mining Regulations."

THE HEADINGS INSERTED IN FRONT OF EACH SECTION ARE TO BE USED ONLY FOR EASE OF REFERENCE DURING THE REVIEW OF THE PROPOSED REGULATIONS. THEY ARE NOT PART OF THE REGULATION AND WILL NOT BE PRINTED IN THE OFFICE CONSOLIDATION.

PROPOSED REVISION TO THE REGULATION FOR
CONSTRUCTION PROJECTS, IN DETAIL

SECTION 100 - ELECTRICAL EQUIPMENT AND INSTALLATIONS

Existing:

100. Except where the connection is made by inserting an attachment plug cap on the cord of the electrical equipment or tool into a convenience receptacle, only a worker who is an electrician certified under the *Apprenticeship and Tradesmen's Qualification Act* or a worker who is similarly qualified by training and experience shall connect any electrical equipment or tool to a power source or disconnect any electrical equipment or tool from a power source. O. Reg. 659/79, s. 100.

NOTE: Temporary Wiring Installations for Buildings or Projects under construction or demolition are covered by Section 76 of the Electrical Safety Code, under the Power Corporation Act, R.S.O. 1980, c. 384. Copies can be obtained from Ontario Hydro inspection offices.

Proposed:

C.1. (1) Electrical equipment, power lines and insulating materials shall,

- (a) be suitable for its or their use, and
- (b) only be installed, maintained, modified or operated in such a manner as not to present a hazard to a worker.

(2) Only a competent person who is an electrician certified under the Apprenticeship and Tradesmen's Qualification Act or a competent person who is equivalently qualified by training and experience shall install, maintain, or modify electrical equipment or installations.

(3) Except where the connection is made by inserting an attachment plug cap on the cord of the electrical equipment or tool into a convenience receptacle, only a worker who has qualifications referred to in subsection (2) shall connect any electrical equipment or tool to a power source or disconnect any electrical equipment or tool from a power source.

NOTE: The requirements of the Electrical Safety Code made under the Power Corporation Act apply to electrical equipment and installations on construction projects.

Rationale:

The first subsection gives general performance standards on electrical equipment and installations.

The intent of the second subsection is to prevent workers on construction projects from performing electrical connections or repairs that they are not qualified to do. An example would be a terrazzo worker connecting his floor grinding machine to a power supply box at 220 volts. In the past there have been critical injuries and fatalities caused by unauthorized workers making electrical connections on their own when connecting extension cords or wires to the source of supply. This subsection requires a certified electrician or a worker who is similarly qualified by training and experience to work on electrical installations.

In the third subsection, an exemption is given for the connection of portable equipment with a plug attachment (as in the existing regulation).

The requirement that electrical installations comply with the Electrical Safety Code (or the Canadian Electrical Code, Part I), and that equipment be certified, adopted in the mining sector, is not endorsed for the Construction Sector because:

- It would require Ministry of Labour Construction inspectors to approve electrical equipment, power lines and insulating material and installations whether they endanger a worker or not.
- It would require inspectors to check all equipment for CSA approval. This would duplicate the duties of the Ontario Hydro Inspection Department.

However, the reader will be reminded in a Note for office consolidation that the provisions of the Electrical Safety Code apply. This Code is enforced by Ontario Hydro. The inspector may however refer to the Electrical Safety Code as specifying "reasonable precaution" to prevent danger to a worker from electrical hazard under a proposed new section (see page 8).

NEW SECTION - TEMPORARY INSTALLATIONS/LIGHTING

Existing: Nil

Proposed:

C.2. A light bulb used in temporary lighting systems shall be enclosed by a mechanical protective device.

Rationale:

This section is intended to address the electrical shock hazard created when unprotected light bulbs are broken. This is a common occurrence with temporary lighting systems on construction projects.

NEW SECTION - REASONABLE PRECAUTION

Existing: Nil

Proposed:

C.3. Every reasonable precaution shall be taken to prevent a hazard to a worker from an energized electrical conductor or equipment.

Rationale:

The intent of this section is to cover all appropriate procedures to protect the worker from electrical hazards.

The procedures specified in industry rule books, such as the EUSA rule book and the corporate safety rules of Ontario Hydro could be referred as specific ways to take reasonable precautions on construction projects as appropriate.

SECTION 105 - WORK IN PROXIMITY TO OVERHEAD CONDUCTORS

Existing:

105.—(1) Subject to subsection (3), a worker shall not bring any object closer to a power line for electricity rated at more than 750 volts than the minimum distance set out in subsection (4).

(2) Subject to subsection (3), a worker shall not move a back-hoe, shovel, crane or other similar lifting device or its load closer than the length of the boom of the lifting device to a power line for electricity rated at more than 750 volts unless he has another worker stationed within his view to warn him when any part of the lifting device or its load is approaching the minimum distance from the power line as prescribed in subsection (4).

(3) Subsections (1) and (2) do not apply where,

(a) the owner of the power line has disconnected, and visibly grounded, the electrical supply to the power line; or

(b) the work is being performed by a private or public electrical utility or a constructor or subcontractor qualified to perform work on or adjacent to power lines, and

(i) the work is performed by workers who are competent persons,

(ii) the work is being performed in accordance with the code of rules, techniques and procedures approved by the Electrical Utilities Safety Association of Ontario, Inc. or Ontario Hydro for work in close proximity to, or in contact with, energized power lines and equipment,

(iii) the work is carried out using tools, clothing and equipment which is adequate and specifically designed for work being performed, and

(iv) the work is supervised by a competent person.

(4) The minimum distance referred to in subsections (1) and (2) shall be the distance set out in column 2 of the following Table for the voltage set opposite thereto in column 1 of the following Table:

TABLE

Minimum Distance from Live Power Lines for Electricity	
COLUMN 1	COLUMN 2
Voltage Rating of Power Line	Minimum Distance
750 to 150,000 volts	3 metres
150,001 to 250,000 volts	4.5 metres
over 250,000 volts	6 metres

O. Reg. 659/79, s. 105.

NOTE: Where line voltage is unknown, contact the Ontario Hydro or local power utility offices. If uncertain, assume it is over 750 volts.

Proposed:

- C.4. (1) Except as provided in subsection (4) and in section 6, no object, including any equipment, or any part thereof, shall be brought closer to an energized outdoor overhead electric conductor of the voltage set out in column 1 of the following Table than the distance specified opposite thereto in column 2:

TABLE

Column 1 Conductor Voltage	Column 2 Minimum Distance
750 to 150,000 volts	3 metres
over 150,000 to 250,000 volts	4.5 metres
over 250,000 volts	6 metres

(2) Except as provided in subsection (4) and section 6, where a crane, hoisting device, back-hoe, power shovel or vehicle or any other equipment is operated near an energized outdoor overhead electric conductor and it is possible for any part of the equipment or its load to encroach on the minimum distance required by subsection (1), or when the hoisting device is positioned closer than the length of the boom of the hoisting device to an energized outdoor overhead electrical conductor,

- (a) a legible sign, clearly visible to the operator and warning of the potential electrical hazard, shall be posted at the operator's station; and
- (b) a person who is designated to be a signaller shall be stationed,
 - (i) in full view of the operator; and
 - (ii) with a clear view of the equipment and the power line,

to warn the operator each time any part of the equipment or its load may approach such minimum distance.

- (3) Section 130 applies with necessary modifications where a signaller is required under subsection (2).

(4) Subsection (1) does not apply where,

- (a) mats, shields or other protective devices adequate to ensure protection from electrical shocks and burns have been installed under the authority of the owner of the conductor or equipment; and**
- (b) the person who is bringing the object or equipment or is causing the object or equipment to be brought within the minimum distance is using procedures adequate to insure protection from electrical shock and burns and is a competent person.**

Rationale:

The first subsection specifies the minimum distances to be kept between objects and energized overhead outdoor electric power lines, by operating voltage category so that no electrical arcing may occur between the object and the line. The lower voltage for which a minimum distance is specified is 750 V. It is not practicable to stipulate minimum distances for lower voltages, as the clearance would not be available (e.g., construction work under trolley lines, power supply to factory, demolition). The requirement on "objects" is more encompassing than existing wording which covers "vehicle, crane or similar equipment".

The second subsection gives procedural requirements for operating equipment with booms or similar devices near an energized line. Booms of hoisting devices are specifically referenced here due to their wide use in construction. The requirement for a signaller specifies now that he/she be appointed and, as per the third subsection, does not perform another task at the same time which may prevent him/her from signalling effectively.

The fourth subsection stipulates 2 exemptions: one when procedures for live work are being followed and the other when the line has been adequately protected and procedures adequate to protect from electrical shock are followed.

The special procedures to be followed when working closer to the specified minimum distance to the line are given as performance standards.

The existing clause 105(3)(a) also provided an exemption for disconnected lines. This exemption is not necessary as the section applies only to energized lines and has been deleted.

SUBSECTION 104(1) - LOCK-OUT**Existing:**

104.—(1) Subject to subsection (2), the power supply to live electrical installations or equipment operating at more than 750 volts shall be disconnected and locked out of service and grounded prior to any work being done on, or in proximity to, the installations or equipment.

Proposed:

- C.5. (1) The power supply to electrical installations, equipment or power lines shall be disconnected and locked and tagged out of service prior to and during any work being done on, or in proximity to, the installations, equipment or power lines.
- (2) Where a power supply is required by subsection (1) to be disconnected, each worker doing the work shall ascertain, before commencing work, that the power supply is disconnected.
- (3) Notwithstanding subsection (1), locking out and tagging is not required,
- (a) if live work is permitted by section 6;
 - (b) if the power lines are effectively grounded with a visible grounding mechanism; or
 - (c) if the voltage is less than 300 volts and there is no locking device for the circuit breakers or fuses.
- (4) A tag required by subsection (1) shall,
- (a) be made of non-conducting material;
 - (b) be secured to prevent its inadvertent removal;
 - (c) state the reason the switch is opened;
 - (d) show the name of the person responsible for opening the switch; and
 - (e) show the date on which the switch was opened.

Rationale:

The first subsection specifies the requirements for locking out. Subsection 3 will provide 3 exemptions from locking and tagging out, i.e.:

- live work technique as prescribed in section C.6.;
- visible grounding (used mostly in power line work where, because of remote location and higher probability of lightning, locking out is not practical); and
- where the voltage is less than 300 V and the equipment is not equipped with a lock out device. The standards of Part II of The Canadian Electrical Code do not require lock-out for all equipment below 300V (e.g.: C 22.2 No. 29-M1983 Panelboards and Panelboard Enclosures). The intent of this clause is to protect the worker, whenever feasible, recognizing that it would not be technically feasible to require lock-out for all equipment under 300 V.

In addition, a new subsection (2) shall be added to require that the worker verify that the line is de-energized to prevent any false assumption or problem arising from poor communication. This verification could be done visually or by communication with another worker or by suitable testing.

SUBSECTION 104(2) - LIVE WORK**Existing:**

~~104~~(2) Where it is not practicable to disconnect the power supply to live electrical installations or equipment,

- (a) rubber gloves, mats, shields or other protective equipment, tools and procedures adequate to ensure the safety of all workers shall be used, by competent workers, while the work is being performed; and
- (b) a worker other than the worker doing the work, who is competent in the use of artificial respiration, shall be readily available while the work is being performed. O. Reg. 659/79, s. 104.

Proposed:

C.6. (1) Subject to subsection (2), where work is to be done on energized electrical equipment or conductor and it is not practicable to disconnect the equipment or conductor from the power supply,

- (a) the work shall be performed by a competent person who has the qualifications referred to in subsection 2 of section 1;
- (b) rubber gloves, mats, shields and electrical shock resistant footwear, or other protective equipment and procedures adequate to ensure protection from electrical shocks and burns shall be used while the work is being performed;
- (c) where the equipment or conductor is operating at 300 volts or over but less than 750 volts, a person, other than the worker doing the work, competent to perform rescue operations, including cardiopulmonary resuscitation and suitably equipped, shall be conveniently available while the work is being performed; and
- (d) where the equipment or conductor is operating at 750 volts or over, a person, other than the worker doing the work, competent to perform rescue operations, including cardiopulmonary resuscitation, suitably equipped and competent in the work to be done, shall be conveniently available while the work is being performed.

(2) Clauses (1)(c) and (d) do not apply to troubleshooting, installing or replacing meters or to the testing of appliances or instruments by competent workers.

Note: Adherence to Canadian Standards Association standard Z195-M1984 complies with the intent of clause b of subsection 1 regarding electrical shock resistant footwear.

Rationale:

This section stipulates live work procedures to be followed, with additional requirements above 300V and above 750V. The requirement for a stand-by person competent in artificial respiration has been upgraded to CPR competence as electrical shocks may cause cardiac arrest. Comments are invited as to the feasibility and effectiveness of this proposed requirement.

The existing section does not impose any requirement for live work below 750V, although such voltages may present a hazard.

Subsection 2 provides an exemption for work on automobile ignition systems, TV sets, cathode ray tubes, meters, and other similar equipment which are not the major source of injuries from electrical contact. Work on meters, which are above 300 volts, does not present a hazard when done by competent workers, and has also been exempted.

This section is being included in the Amendments to the Construction Regulations sent out for comments on February 10, 1986 to clarify the application of the procedures to live work under 750 V. Pending comments to be received on this document, further amendments may be made to this section.

CLAUSE 68(c) - TOOLS NEAR LIVE CONDUCTOR**Existing:**

68. A ladder shall, . . .

- (c) if the side rails are made of metal, or if they are metal-reinforced, not be used in close proximity to uninsulated, energized electrical equipment or conductors. O. Reg. 659/79, s. 68.

Proposed:

C.7. Except where work is being carried out as permitted by section 6, tools, ladders, scaffolding and other equipment, capable of conducting electricity thereby endangering the safety of anyone, shall not be stored or used in such proximity to any energized electrical installation, equipment or conductor as to make electrical contact with an energized conductor.

Rationale:

The purpose of this section is to prevent electrical contact between conductive equipment and live equipment.

Existing wording has been modified to:

1. allow exemption for live work procedures;
2. apply the requirements to any conductive equipment rather than ladders only; and
3. add prohibition of storage to that of use, as electrical contact may also occur under storage conditions.

CLAUSE 17 (2)(f) - ENTRANCE TO ROOM WITH LIVE PARTS**Existing:**

- 17. (2)** ^(f) at the entrance to a room or enclosure containing exposed live electrical parts, and the sign shall forbid entry by any unauthorized person. O. Reg. 659/79, s. 17.

Proposed:

- C.8. (1) No person, other than a person authorized to do so by the supervisor in charge of the work, shall enter or be permitted to enter a room or other enclosure containing exposed energized electrical parts.**
- (2) The entrance to a room or other enclosure containing exposed energized electrical parts shall be marked by conspicuous signs warning of the danger of exposed energized electrical parts and stating that only persons authorized by the supervisor in charge of the work may enter.**

Rationale:

This section requires that not only must a sign be posted restricting the entrance to a room with live parts as in the existing section, but also that entrance to the room be actually restricted. The sign alone is not sufficient protection from the hazard.

SECTIONS 101 AND 102 – PANEL BOARDS AND SWITCHES

Existing:

101. A panel board shall be,

- (a) securely mounted on a vertical surface of sound construction;
- (b) kept clear of any obstruction in front of the panel board;
- (c) within easy reach of and readily accessible to workers;
- (d) located in an area where water will not accumulate; and
- (e) provided with a cover over uninsulated parts carrying current. O. Reg. 659/79, s. 101.

102. A switch controlling a service entrance, service feeder or branch circuit shall,

- (a) be suitable for its intended use;
- (b) be securely mounted on a vertical surface of sound construction;
- (c) be kept clear of any obstruction in front of the switch;
- (d) be within easy reach of and readily accessible to workers;
- (e) be located in an area where water will not accumulate;
- (f) not be locked in the closed position;
- (g) be provided with a device for locking the switch in the open position; and
- (h) over uninsulated parts carrying current, be provided with a cover with a locking device that is,
 - (i) effective when the switch is in both the open and closed position, and
 - (ii) locked when the switch is in the closed position. O. Reg. 659/79, s. 102.

Proposed:

C.9. (1) Every switch and temporary panel board controlling a service entrance, service feeder or branch circuit shall be,

- (a) securely mounted on a vertical surface of sound construction;
- (b) kept clear of any obstruction in front of the panel board;

- (c) within easy reach of and readily accessible to workers;
 - (d) located in an area where water will not accumulate;
and
 - (e) provided with a cover over uninsulated parts carrying current.
- (2) Every switch controlling a service entrance, service feeder or branch circuit shall,
- (a) not be locked in the closed position;
 - (b) be provided with a device for locking the switch in the open position; and
 - (c) over uninsulated parts carrying current, be provided with a cover with a locking device that is,
 - (i) effective when the switch is in both the open and closed position, and
 - (ii) locked when the switch is in the closed position.

Rationale:

This section specifies requirements for panel boards and switches. Clause 102(a) has been deleted, as it is now covered by the new clause C.1(1)(a).

Subsections 102(b) to (e) and 101 (a) to (e) have been consolidated as they specified the same requirements for switches and panel boards respectively.

The remaining requirements for switches have been regrouped in one subsection.

SECTIONS 103 & 199 - EQUIPMENT GROUNDING

Existing:

103.—(1) Subject to subsection (2), any cord-connected electrical equipment or tool shall have a casing which is effectively grounded.

(2) Subsection (1) does not apply to any cord-connected electrical equipment or tool that is effectively double-insulated and that does not show any evidence of cracks or defects in the insulated casing. O. Reg. 659/79, s. 103.

NOTE: All electrical equipment must be approved in accordance with the Electrical Safety Code, under the Power Corporation Act, R.S.O. 1980, c. 384. Canadian Standards Association certification or Ontario Hydro Special Inspection will fulfill requirements for approval.

199. All electrical pumps, electrical tools and similar equipment shall be,

(a) effectively grounded; or

(b) double or fully insulated. O. Reg. 659/79, s. 199.

Proposed:

C.10. (1) Subject to subsections (2) and (3), any cord-connected electrical equipment or tool shall have a casing which is effectively grounded.

(2) Subsection (1) does not apply to any cord-connected electrical equipment or tool that is effectively double-insulated and that does not show any evidence of cracks or defects in the insulated casing.

(3) Subsection (1) does not apply where a portable electric generator is used in a location where the equipment is not exposed to an external electric power source and where the non-current carrying parts of the generator are bonded to the casing of portable electrical tools connected to the generator.

Rationale:

Subsections (1) and (2) are similar to the sections in the existing regulation which address the grounding and double-insulating of cord-connected tools and equipment.

The proposed subsection (3) addresses the more specific grounding requirements for portable electrical generator.

NEW SECTIONS – GROUND FAULT

Existing: Nil

Proposed:

- C.11. Portable electrical tools, when used in wet locations, shall be protected by a ground fault circuit interrupter.**
- C.12. Where there is an indication of a ground fault which could present a hazard to persons, the ground fault shall be investigated and removed without delay.**

Rationale:

Because of the potential shock hazard when electrical tools are used in wet locations, and the fact that ground fault circuit interrupters are now readily available on the market place at a reasonable cost, a new section has been added to protect workers from ground faults on portable tools.

Ground fault detection devices on ungrounded systems were not a mandatory requirement of the Electrical Safety Code until the 1983 edition, therefore many systems are not so equipped. However, in cases where such devices are installed, and indicate a fault, the second new section requires quick removal of the hazard.

SUBSECTION 186(2) - CABLES IN TUNNELS AND SHAFTS**Existing:**

186.—(2) Electrical cable or gas hose shall not be taken or used underground unless,

- (a) it has an armoured casing or jacket of a material that is not readily flammable and does not readily support combustion; and
- (b) it is marked to indicate that it has the casing or jacket required under clause (a). O. Reg. 659/79, s. 186.

Proposed:

C.13. (2) Electrical cable shall not be taken or used underground unless,

- (a) it is armoured or protected by metal conduit when operating at over 150 volts to ground; and
 - (b) it is armoured, protected by metal conduit or has an outer covering that will not support combustion and is so identified continually, when operating below 150 volts to ground.
- (3) Gas hose shall not be taken or used underground unless,
- (a) it is armoured or protected by metal conduit; and
 - (b) it has an outer covering that will not support combustion and is so identified continually.
- (4) Spliced cable shall not be used in a shaft except for a temporary period where emergency power is required.

Note: FT4 as specified in to Canadian Standards Association standard C22.2 No. 131-1986 meets the intent of clause b of subsections 2 and 3.

Rationale:

The purpose of this section is to protect underground cable from physical damage which would make it hazardous. Existing wording has been slightly modified for consistency with provisions of the Mining Regulations:

- metal conduit is required only for cables over 150V as lower voltages do not present a significant hazard; and
- cable used in shaft must not have been spliced.

SECTION 198 - GROUND FAULT IN TUNNELS AND SHAFTS**Existing:**

198. All electrical circuits of 100 volts or more shall be in an insulated cable consisting of at least two feed wires and a grounding wire. O. Reg. 659/79, s. 198.

Proposed:

C.14. Cord-connected portable electrical tools, pumps and machinery used in a tunnel or a shaft shall be protected by a ground fault circuit interrupter.

Rationale:

Because of the potential shock hazards when electrical tools are used in tunnels or shafts, which are usually wet locations, and the fact that ground fault circuit interrupters are now readily available on the market place at a reasonable cost, their use must be made a mandatory requirement. The same requirement is made in the general Part I but needs to be repeated in the specific Part on Tunnels and Shafts.

NEW SECTION - EQUIPMENT NO LONGER USED

Existing: Nil

Proposed:

C.15. Where electrical equipment or power line is no longer used for the purpose for which it was intended or designed, the electrical equipment or power line shall be isolated, de-energized and,

- (a) removed; or**
- (b) when left in place, locked out.**

Rationale:

Equipment no longer in use could be energized without the knowledge of nearby persons and present a hazard. The requirements of this section would prevent such a hazard.

SUBSECTION 119 (8) - ELECTRICAL HAZARD IN CONFINED SPACES**Existing:**

119-(8) Where the confined space is a manhole or vault containing electrical equipment, the work shall be,

- (a) performed by an electrical utility or an employer specializing in such work;
- (b) carried out by at least two competent persons;
- (c) performed in accordance with the code of rules, techniques and procedures approved by the Electrical Utilities Safety Association of Ontario, Inc. or Ontario Hydro for work in manholes and vaults containing electrical equipment;
- (d) carried out using tools, clothing and equipment that is adequate and specifically designed for the work being performed; and
- (e) supervised by a competent person.

Proposed: Deleted

Rationale:

Electrical procedures covered by this subsection will be more adequately addressed by the amendments in the proposal. Accordingly this subsection is deleted to prevent any unnecessary duplication.

NEW PART - ELECTRICAL UTILITY WORK

Existing: Nil

Proposed:

C.16. In this Part,

- (a) "electrical utility work" means work performed to install, modify and maintain electrical equipment and conductors rated at more than 750 volts; and
- (b) "hold-off" means a procedure to establish a method to prohibit re-energizing of apparatus or circuits under this protection.

C.17. This Part applies to electrical utility work.

C.18. (1) Electrical utility work shall be carried out by a private or public electrical utility or an electrical utility contractor qualified to perform the work and approved by the utility.

(2) The work shall be performed only by,

- (a) a competent person who has been designated as a journeyman-lineman by the utility, or
- (b) a competent person who has been designated as a journeyman-lineman in training by the utility and who is continuously supervised by a designated journeyman-lineman.

C.19. Where work is to be done on or in close proximity to energized electrical equipment or conductors operating at more than 750 volts, the work shall be carried out by workers who are adequately insulated from other energized conductors or grounded components.

C.20. Rubber gloves, insulating blankets and other protective equipment and devices shall be adequate to protect the worker from electrical hazards and shall be dielectrically tested as recommended by the manufacturer.

C.21. Work on or in close proximity to energized electrical conductors, apparatus or equipment shall be done only under the protection of a hold-off.

C.22. Work in close proximity to energized electrical conductors, apparatus or equipment at the voltage specified in column 1 shall be done outside the minimum distance specified in column 2 of,

- (a) Table I when the work is done by a worker under the supervision of a designated journeyman-lineman,
- (b) Table II when the work is done by a designated journeyman-lineman, or
- (c) Table III when the work is done using earth augers, radial boom or pole derricks.

TABLE I

Column 1 Conductor Voltage	Column 2 Minimum Distance
750 to 15,000 volts	0.6 metre
over 15,000 to 35,000 volts	0.9 metre
over 35,000 to 50,000 volts	1.2 metres
over 50,000 to 150,000 volts	1.5 metres
over 150,000 to 350,000 volts	2.1 metres
over 350,000 volts	3.6 metres

TABLE II

Column 1 Conductor Voltage	Column 2 Minimum Distance (journeyman-lineman)
750 to 15,000 volts	0.3 metre
over 15,000 to 35,000 volts	0.45 metre
over 35,000 to 150,000 volts	0.6 metre
over 50,000 to 150,000 volts	0.9 metre
over 150,000 to 350,000 volts	1.2 metres
over 350,000 volts	2.7 metres

TABLE III

Column 1 Conductor Voltage	Column 2 Minimum Distance (Earth Augers, Radial Boom and Pole Derricks)
750 to 35,000 volts	0.9 metre
over 35,000 to 50,000 volts	1.2 metres
over 50,000 to 350,000 volts	3.0 metres
over 350,000 volts	6.0 metres

- C.23 Installation or removal of wires in close proximity to energized conductors, apparatus or equipment shall be performed only when,

- (a) the wires being installed or removed, the machinery, equipment, vehicles and devices used to perform the work are effectively grounded;
 - (b) the machinery and equipment used in installing or removing wire under tension are:
 - (i) effectively grounded and completely surrounded by a bonded ground gradient control mat;
 - (ii) surrounded by a fence at least one metre in height, and;
 - (iii) where the fence is composed of conductive material, it is effectively grounded;
 - (c) travellers and pulleys used in the installation or removal of overhead wires are effectively grounded at each end pole and at every 5th intermediate pole;
 - (d) the workers performing the work are protected by insulated protective equipment adequate to protect the worker from electrical hazards; and
 - (e) protective devices have been installed to prevent the wires from falling onto a public way.
- C.24 Bare hand live line work on overhead conductors shall be carried out under the protection of a hold-off and only if,**
- (a) the worker is a competent person and has been designated by the utility to perform bare hand, live line work;
 - (b) insulated aerial devices are used as work platforms; and
 - (c) bonding wires are attached to the same conductor bridging the work area to ensure that the conductor remains at the same potential at all times.

Rationale:

The existing section 105 endorsed the rules approved by EUSA and Ontario Hydro as they related to electrical utility work. These rules were referenced in the past in order to regulate work procedures necessary to address the specific hazards associated with this very specialized construction activity. This reference to EUSA and Ontario Hydro has not always been effective since many utilities and utility contractors are not EUSA members and it appeared that EUSA had indirect control of the regulatory process.

The proposed sections describe performance standards which specifically target work procedures related to electrical utility work. It is necessary to define electrical utility work since it includes line work on both energized and non-energized equipment. It is also felt that these sections should be drafted as a separate Part of the Construction Regulations since the procedures relate only to a very specialized sector of the construction industry.

**PROPOSED REVISIONS TO THE REGULATIONS FOR
INDUSTRIAL ESTABLISHMENTS, IN DETAIL**

SECTION 44 - ELECTRICAL EQUIPMENT AND INSTALLATIONS

Existing:

44. Electrical equipment, insulating materials and conductors shall be,

(a) suitable for its use; and

(b) certified by,

(i) the Canadian Standards Association,
or

(ii) the Ontario Hydro Electrical Inspection Department. O. Reg. 658/79,
s. 44.

Proposed:

1.1. Electrical equipment, power lines and insulating materials shall,

(a) be suitable for its or their use, and

(b) only be installed, maintained, modified or operated in such a manner as not to present a hazard to a worker.

Note: The requirements of the Electrical Safety Code made under the Power Corporation Act apply to electrical equipment and installations.

Rationale:

This section stipulates general performance standards requirements for both electrical equipment and installations.

The Note for Office Consolidation is a reminder of the Electrical Safety Code requirements and its enforcement by Ontario Hydro.

SECTION 64 - WORK IN PROXIMITY TO OVERHEAD CONDUCTORS

Existing:

64.—(1) Except as prescribed by subsection 46 (3), where a vehicle, crane or similar equipment is operated near a live power line carrying electricity at more than 750 volts, every part of the equipment shall be kept at least the minimum distance from the live power line set out in Column 2 of the Table for the particular voltage set out opposite thereto in Column 1 of the Table:

TABLE

Minimum distance from live power lines for electricity	
COLUMN 1	COLUMN 2
Voltage of live power line	Minimum Distance
750 to 150,000 volts	3 metres
150,001 to 250,000 volts	4.5 metres
250,001 volts and over	6 metres

(2) Subject to subsection 46 (3), where a vehicle, crane or similar equipment is operated near a live power line, and it is possible for any part of the vehicle, crane or similar equipment or its load to make contact with the live power line,

(a) a worker shall be stationed within the view of the operator to warn him when any part of the equipment is approaching the minimum distance from the live power line; and

(b) clearance shall be allowed for any change in boom angle and for any swing of the hoisting cable and load. O. Reg. 658/79, s. 64.

Proposed:

I.2. (1) Except as provided in subsection (4) and in section 4, no object including any equipment, or any part thereof, shall be brought closer to an energized outdoor overhead electric conductor of the voltage set out in column 1 of the following Table than the distance specified opposite thereto in column 2:

TABLE

Column 1 Conductor voltage	Column 2 Minimum distance
750 to 150,000 volts	3 metres
over 150,000 to 250,000 volts	4.5 metres
over 250,000 volts	6 metres

(2) Except as provided in subsection (4) and section 4, where a crane, hoisting device, back-hoe, power shovel or vehicle or any other equipment is operated near an energized outdoor overhead electric conductor and it is possible for any part of the equipment or its load to encroach on the minimum distance required by subsection (1),

- (a) a legible sign, clearly visible to the operator and warning of the potential electrical hazard, shall be posted at the operator's station; and
- (b) a person who is designated to be a signaller shall be stationed,
 - (i) in full view of the operator; and
 - (ii) with a clear view of the equipment and the power line,

to warn the operator each time any part of the equipment or its load may approach such minimum distance.

(3) Section 60 applies with necessary modifications where a signaller is required under subsection (2).

(4) Subsection (1) does not apply where,

- (a) mats, shields or other protective devices adequate to ensure protection from electrical shocks and burns have been installed under the authority of the owner of the conductor or equipment; and
- (b) the person who is bringing the object or equipment or is causing the object or equipment to be brought within the minimum distance is using procedures adequate to insure protection from electrical shock and burns and is a competent person.

Rationale:

The first 2 subsections are edited versions of the existing section and have 2 exemptions: one for live work on energized lines as in the existing regulation and a new exemption. The new exemption, in subsection 4, to the minimum distances to overhead lines is for persons trained and/or certified by an electrical utility to carry out safely this type of work. A similar exemption exists now in the Construction Regulations.

"Outdoor" defines the scope of application of section I.2. since indoor installations must conform to the Electrical Safety Code (section 2202) which is enforced by Ontario Hydro, and are also covered by the proposed section I.5. (formerly s.47).

The lower voltage for which a minimum distance is specified is 750V. Most lines below 750V in industrial establishments are in insulated cables. Section I.5., which prohibits storage of conductive equipment near lines, gives further protection from the hazard. It would not be practicable to specify minimum distances at lower voltages as the clearance may not be available (e.g. trolley lines).

SUBSECTION 46(1) – LOCK-OUT**Existing:**

46.—(1) Subject to subsections (2) and (3), the power supply to electrical installations, equipment or power lines shall be disconnected and locked out of service prior to any work being done on, or in proximity to, the installations, equipment or power lines.

Proposed:

- 1.3. (1) The power supply to electrical installations, equipment or power lines shall be disconnected, locked and tagged out of service prior to and during any work being done on, or in proximity to, the installations, equipment or power lines.**
- (2) Where a power supply is required by subsection (1) to be disconnected, each worker doing the work shall ascertain, before commencing work, that the power supply is disconnected.**
- (3) Notwithstanding subsection (1), locking out and tagging are not required,**
- (a) if live work is permitted by section 4;**
 - (b) if the power lines are effectively grounded with a visible grounding mechanism; or**
 - (c) if the voltage is less than 300 volts and there is no locking device for the circuit breakers or fuses.**
- (4) A tag required by subsection (1) shall,**
- (a) be made of non-conducting material;**
 - (b) be secured to prevent its inadvertent removal;**
 - (c) state the reason the switch is opened;**
 - (d) show the name of the person responsible for opening the switch; and**
 - (e) show the date on which the switch was opened.**

Rationale:

Subsection 3(3) will provide 3 exemptions from locking and tagging out, i.e.:

- live line technique;
- visible grounding (used mostly in power line work where, because of remote location and higher probability of lightning, locking out is not practical); and
- where the voltage is less than 300V and there is no lock-out device visible grounding. The standards of Part II of the Canadian Electrical Code do not make provisions for lock-out for all equipment below 300V (e.g. C22.2 No. 29-M1983 Panelboards and Panelboard Enclosures). The intent of this clause is to protect the worker, whenever feasible, recognizing that it would not be technically feasible to require lock-out for all equipment under 300V.

In addition, a new subsection shall be added as 3(2) to require that not only the line be de-energized but also be ascertained to be de-energized prior to working on the line. This last check could be done visually or by communication with another worker or by testing.

SUBSECTIONS 46(2) & (3) - LIVE WORK**Existing:**

- 46.** (2) Where it is not practicable to disconnect and lock out the power supply to live electrical installations, equipment or power lines,
- (a) rubber gloves, mats, shields or other protective equipment adequate to ensure the safety of all workers shall be used while the work is being performed; and
 - (b) a person other than the worker doing the work who is trained in the use of artificial respiration, shall be conveniently available while the work is being performed.
- (3) Where work is to be done on a power line of 750 volts or over, and the power supply cannot be disconnected and locked out of service,
- (a) the work shall be carried out by a competent person under the authority of an electrical utility; and
 - (b) rubber gloves, mats, shields or other protective equipment, and procedures adequate to ensure the safety of all workers shall be used while work is being performed; and
 - (c) a person, other than the worker doing the work, who is trained in the use of artificial respiration, shall be conveniently available while the work is being performed. O. Reg. 658/79, s. 46.

Proposed:

- I.4. (1) Subject to subsection (2), where work is to be done on energized electrical equipment or conductor, and it is not practicable to disconnect the equipment or conductor from the power supply,**
- (a) the work shall be performed by a competent person;**
 - (b) rubber gloves, mats, shields, electrical shock resistant footwear, or other protective equipment and procedures adequate to ensure protection from electrical shocks and burns shall be used while the work is being performed;**
 - (c) where the equipment or conductor is operating at 300 volts or over but less than 750 volts, a person, other than the worker doing the work, competent to perform rescue operations, including cardiopulmonary resuscitation and suitably equipped, shall be conveniently available while the work is being performed; and**

- (d) where the equipment or conductor is operating at 750 volts or over, a person, other than the worker doing the work, competent to perform rescue operations, including cardiopulmonary resuscitation, suitably equipped, and competent in the work to be done, shall be conveniently available while the work is being performed.

(2) Clauses (1)(c) and (d) do not apply to troubleshooting, installing or replacing meters or to the testing of appliances or instruments by competent workers.

Note: Adherence to Canadian Standards Association standard Z195-M1984 complies with the intent of clause b of subsection 1 regarding electrical shock resistant footwear.

Rationale:

Live work procedures have been divided into 3 voltage categories, corresponding to different degrees of hazard. The requirement for a stand-by person trained in artificial respiration has been upgraded to CPR competence as electrical shocks may cause cardiac arrest. Comments are invited as to the feasibility and effectiveness of this proposed requirement.

Subsection 2 provides an exemption for work on automobile ignition systems, TV sets, cathode ray tubes metres and other similar equipment which are not the major source of injuries from electrical contact. Work on meters, which are above 300 volts, does not present a hazard when done by competent workers, and has also been exempted.

SECTION 47 - TOOLS NEAR LIVE CONDUCTOR**Existing:**

47. Tools and other equipment, that are capable of conducting electricity and endangering the safety of any worker shall not be used in such proximity to any live electrical installation or equipment that they might make electrical contact with the live conductor.
O. Reg. 658/79, s. 47.

Proposed:

- I.5. Except where work is being carried out as permitted by section 4, tools, ladders, scaffolding and other equipment, capable of conducting electricity thereby endangering the safety of anyone, shall not be stored or used in such proximity to any energized electrical installation, equipment or conductor as to make electrical contact with an energized conductor.**

Rationale:

The purpose of this section is to prevent electrical contact between conductive equipment and live equipment.

Existing wording has been modified to:

- 1) allow exemption for live work procedures;
- 2) include a more specific list of equipment; and
- 3) add prohibition of storage to that of use, as electrical contact may also occur under storage conditions.

SECTION 45 - ENTRANCE INTO ROOM WITH LIVE PARTS**Existing:**

45. The entrance to a room or similar enclosure containing exposed live electrical parts shall have a conspicuous sign, warning of the danger, and forbidding entry by unauthorized persons. O. Reg. 658/79, s. 45.

Proposed:

- I.6. (1) No person, other than a person authorized to do so by the supervisor in charge of the work, shall enter or be permitted to enter a room or other enclosure containing exposed energized electrical parts.**
- (2) The entrance to a room or other enclosure containing exposed energized electrical parts shall be marked by conspicuous signs warning of the danger of exposed energized electrical parts and stating that only persons authorized by the supervisor in charge of the work may enter.**

Rationale:

This section requires that not only must a sign be posted restricting the entrance to a room with live parts as in the existing section, but also that entrance to the room be actually restricted. The sign alone is not sufficient protection from the hazard.

SECTION 48 – EQUIPMENT GROUNDING

Existing:

48. Cord-connected electrical equipment and tools shall be effectively grounded. O. Reg. 658/79, s. 48.

Proposed: deleted

Rationale:

Covered by I.1.(a).

NEW SECTIONS - GROUND FAULT

Existing: Nil

Proposed:

- I.7. Portable electrical tools, when used in wet locations, shall be protected by a ground fault circuit interrupter.**
- I.8. Where there is an indication of a ground fault which could present a hazard to persons, the ground fault shall be investigated and removed without delay.**

Rationale:

A new section has been added to protect workers as ground fault circuit interrupters are more readily available now to the industry.

Ground fault detection devices on ungrounded systems were not a mandatory requirement of the Electrical Safety Code until the 1983 edition, therefore many existing systems are not so equipped. However, in cases where such devices are installed, and it indicates a fault, the second new section requires quick removal of the hazard.

NEW SECTION - EQUIPMENT NO LONGER USED

Existing: Nil

Proposed:

- I.9. Where electrical equipment or power line is no longer used for the purpose for which it was intended or designed, the electrical equipment or power line shall be isolated, de-energized and,**
- (a) removed; or**
 - (b) when left in place, locked out.**

Rationale:

Equipment no longer in use could be energized without the knowledge of nearby persons and present a hazard. The requirements of this section would prevent such a hazard.

NEW SECTIONS - ELECTRICAL UTILITY WORK

Existing: Nil

Proposed:

1. X. "electrical utility work" means work performed to install, modify and maintain electrical equipment and conductors rated at more than 750 volts; and
- X. "hold-off" means a procedure to establish a method to prohibit re-energizing of apparatus or circuits under this protection;
- I.10. (1) Electrical utility work shall be carried out by a private or public electrical utility or an electrical utility contractor qualified to perform the work and approved by the utility.
- (2) The work shall be performed only by,
 - (a) a competent person who has been designated as a journeyman-lineman by the utility, or
 - (b) a competent person who is continuously supervised by a designated journeyman-lineman.
- (3) Rubber gloves, insulating blankets and other protective equipment and devices shall be adequate to protect the worker from electrical hazards and shall be dielectrically tested as recommended by the manufacturer.
- (4) Work on or in close proximity to energized electrical conductors, apparatus or equipment shall be done only under the protection of a hold-off.
- (5) Work in close proximity to energized electrical conductors, apparatus or equipment at the voltage specified in column 1 shall be done outside the minimum distance specified in column 2 of,
 - (a) Table I when the work is done by a worker under the supervision of a designated journeyman-lineman,
 - (b) Table II when the work is done by a designated journeyman-lineman, or
 - (c) Table III when the work is done using earth anchors, radial boom or pole derricks.

TABLE I

Column 1 Conductor Voltage	Column 2 Minimum Distance
750 to 15,000 volts	0.6 metre
over 15,000 to 35,000 volts	0.9 metre
over 35,000 to 50,000 volts	1.2 metres
over 50,000 to 150,000 volts	1.5 metres
over 150,000 to 350,000 volts	2.1 metres
over 350,000 volts	3.6 metres

TABLE II

Column 1 Conductor Voltage	Column 2 Minimum Distance (journeyman-lineman)
750 to 15,000 volts	0.3 metre
over 15,000 to 35,000 volts	0.45 metre
over 35,000 to 150,000 volts	0.6 metre
over 50,000 to 150,000 volts	0.9 metre
over 150,000 to 350,000 volts	1.2 metres
over 350,000 volts	2.7 metres

TABLE III

Column 1 Conductor Voltage	Column 2 Minimum Distance (Earth Augers, Radial Boom and Pole Derricks)
750 to 35,000 volts	0.9 metre
over 35,000 to 50,000 volts	1.2 metres
over 50,000 to 350,000 volts	3.0 metres
over 350,000 volts	6.0 metres

Rationale:

The Electrical Utility Work sections developed for the Construction Sector and which are relevant to the Industrial Sector have been adopted principally for maintenance activities such as cleaning of insulators and tree trimming in power lines right-of-way.

**PROPOSED REVISIONS TO THE REGULATION FOR
MINES & MINING PLANTS, IN DETAIL**

**SUBSECTIONS 148(1) & (2) AND 166(1), (2) & (3)(a) - ELECTRICAL
EQUIPMENT AND INSTALLATIONS**

Existing:

148.—(1) If electrical equipment is installed or modified, it shall, unless otherwise provided in this Regulation, be installed or modified so that the installation or modification, as the case may be, equals or betters the standards specified in *The Canadian Electrical Code, Part I*, "Safety Standards for Electrical Installations", CSA Standard C22.1-1982. O. Reg. 569/83, s. 34.

(2) Notwithstanding subsection (1), Part V of *The Canadian Electrical Code* does not apply to electrical installations and equipment in mines.

166.—(1) The installations of electrical supply, communications, railway signal and trolley lines shall meet the standards set out in Part III of *The Canadian Electrical Code, C.22.3 No. 1, 1976* "Overhead Systems and Underground Systems". R.R.O. 1980, Reg. 694, s. 166 (1).

(2) Electrical supply lines carried over public railways or over or under navigable waters shall comply with the requirements of the Canadian Transport Commission. R.R.O. 1980, Reg. 694, s. 166 (2); O. Reg. 569/83, s. 36.

(3) Electrical supply lines and equipment shall be,

(a) of a design and construction suitable for the type of service and conditions of use; and

Proposed:

M.1. (1) Electrical equipment, conductors and insulating materials

(a) shall not be installed or used,

(i) unless suitable for its or their use, and

(ii) unless certified by the Canadian Standards Association, the Ontario Hydro Electrical Inspection Department, or an engineer of the Ministry, and

(b) shall be installed, modified and maintained by a competent person according to the standards of Part I of The Canadian Electrical Code, CSA Standard C22.1 - 1982, "Safety Standards for Electrical Installations", unless otherwise provided in this Regulation.

(2) Notwithstanding subsection (1), Part V of The Canadian Electrical Code does not apply to electrical installations and equipment in mines and mining plants.

(3) The installations of electrical supply, communications, railway signal and trolley lines shall meet the standards set out in Part III of The Canadian Electrical Code, CSA Standard C22.3 No.1, 1976 "Overhead Systems and Underground Systems".

Note: **The requirements of the Canadian Transport Commission apply to electrical supply conductors carried over public railways or over or under navigable waters.**

Rationale:

Subsections 148(1) and 166(1) endorse respectively The Canadian Electrical Code, Part I and Part III. They have been regrouped in the same section.

Since The Canadian Electrical Code, Part I refers to The Canadian Electrical Code, Part V as applying to mines, (e.g. section 0), subsection (2) is retained, as Part V is presently under revision and cannot be adopted as yet.

Two requirements have been added:

- that the equipment be suitable for use as a general performance standard for any specific hazard that may not have been covered in other sections;
- that the equipment be certified by CSA, Ontario Hydro or a Ministry engineer. The last possibility is necessary in mines where non-standard equipment is used and where the mining inspectorate plays a role similar to that of Ontario Hydro above ground.

The purpose of subsection 166(2) is not to specify regulatory provisions to be enforced by the mining inspectorate, but to remind interested parties that the requirements of the Canadian Transport Commission apply to electrical conductors over federal transportation systems. The subsection has consequently been deleted and the same wording inserted in an accompanying Note for information purposes.

SUBSECTION 148(3) – LIQUID IN ELECTRICAL EQUIPMENT**Existing:**

148. (3) The quantity and trade name of any liquid insulant or coolant when in excess of one litre shall be shown on the name plate of the electrical equipment in which it is contained.

Proposed:

M.2. If any electrical equipment contains more than one litre of liquid insulant or coolant, the quantity and trade name of the insulant or coolant shall be shown on the name plate of the electrical equipment in which it is contained.

Rationale:

The purpose of this subsection is to identify the type and quantity of liquid so that it can be determined if it will support combustion or not and to take appropriate precautions to prevent potential underground fire. It is not related to electrical equipment and installations and has been set as a separate section, with no change in wording.

SUBSECTION 148(4) - COMPETENT PERSON APPOINTED**Existing:**

148. (4) A person who is competent in the electrical trade shall be appointed to be in charge of electrical equipment. R.R.O. 1980, Reg. 694, s. 148 (2-4).

Proposed:

M.3. A competent person shall be appointed to be in charge of electrical installations, equipment and working procedures.

Rationale:

This subsection is required because in mining, electrical work is done in-house rather than by outside contractors and competent supervision is needed.

It is not related to electrical equipment and installations and has been set as a separate section.

SECTION 151 - TEMPORARY ELECTRICAL INSTALLATIONS**Existing:**

151. Temporary electrical installations may vary from the requirements prescribed for the protection of electrical equipment to provide emergency electrical service only for the period of the emergency if the variation affords protection equal to or greater than the requirements prescribed. R.R.O. 1980, Reg. 694, s. 151.

Proposed: Deleted**Rationale:**

The requirements of this section are covered by the equivalency section (existing section 3).

Also The Canadian Electrical Code Part I, 76 and 12 cover temporary wiring and the new requirement that "equipment be suitable for intended use" covers emergencies. (See new section M.1)

SUBSECTIONS 152(2)(3) AND (5) - WORK IN PROXIMITY TO OVERHEAD CONDUCTORS

Existing:

152. (2) Except as provided for in subsection (1), no object shall be brought closer than the distance specified in column 2 of the following Table to an exposed, energized overhead electric supply line of the voltage specified in column 1;

TABLE

COLUMN 1	COLUMN 2
Voltage of Powerline	Minimum Distance
300 to 150,000 volts	3 metres
150,000 to 250,000 volts	4.5 metres
Over 250,000 volts	6 metres

152. (3) Precautions to guard workers against injury by moving or energized parts shall be taken before maintenance, repair or adjustment work is performed on a machine that is energized. R.R.O. 1980, Reg. 694, s. 152 (1-3).

152. (5) Machines that have movable or extendable booms shall not be operated in close proximity to energized electrical supply lines unless,

- (a) the operator of the machine has been authorized to perform such work; and
- (b) there is a clearance between any part of the machine and the energized line that is more than the greater of,
 - (i) one half the maximum horizontal reach of the boom, or
 - (ii) the distance determined under subsection (2);
- (c) the lines are disconnected and grounded;
- (d) the machine is a railroad crane operating on railroad tracks and the supply line is energized to less than 750 volts direct current; or
- (e) the supply lines are guarded against contact by any part of the machine or its load. R.R.O. 1980, Reg. 694, s. 152 (5).

Proposed:

M.4. (1) Except as provided in subsections (4) and (5), and in section 6, no object, including any equipment, or any part thereof, shall be brought closer to an energized outdoor overhead electric conductor of the voltage set out in column 1 of the following Table than the distance specified opposite thereto in column 2:

TABLE

Column 1 Conductor Voltage	Column 2 Minimum Distance
300 to 150,000 volts	3 metres
over 150,000 to 250,000 volts	4.5 metres
over 250,000 volts	6 metres

(2) Except as provided in subsections (4) and (5), and in section 6, where a crane, hoisting device, back-hoe, power shovel or vehicle or any other equipment is operated near an energized outdoor overhead electric conductor and it is possible for any part of the equipment or its load to encroach on the minimum distance required by subsection (1),

- (a) a legible sign, clearly visible to the operator and warning of the potential electrical hazard, shall be posted at the operator's station; and
- (b) a person who is designated to be a signaller shall be stationed,
 - (i) in full view of the operator, and
 - (ii) with a clear view of the equipment and the power line,

to warn the operator each time any part of the equipment or its load may approach such minimum distance.

- (3) The signaller required by subsection (2),
- (a) shall be a competent person;
 - (b) shall perform no other work while carrying out the assigned duties of a signaller; and
 - (c) shall communicate with the operator of the equipment,

- (i) by the use of prearranged visual signals, when conditions are such that the signals are clearly visible to the operator, or
 - (ii) by the use of a telecommunications system when visual signals are not practical.
- (4) Subsection (1) does not apply where,
 - (a) mats, shields or other protective devices adequate to ensure protection from electrical shocks and burns have been installed under the authority of the owner of the conductor or equipment; and
 - (b) the person who is bringing the object or equipment or is causing the object or equipment to be brought within the minimum distance is using procedures adequate to insure protection from electrical shock and burns and is a competent person.
- (5) A crane operating on railroad tracks may encroach on the minimum distances specified under subsection (1) without complying with subsection (2),
 - (a) if the energized outdoor overhead electric conductor is used for railway power at less than 750 volts direct current; and
 - (b) if when the crane is being used, the operator has been authorized to use it.

Rationale:

The first subsection replacing 152(2) specifies the minimum distances to be kept between objects and energized outdoor overhead electric power lines, by voltage category, so that no electrical arcing may occur between the object and the line.

Minimum distances are required from 300V up to protect from the hazard of 550V lines used at surface mines.

The second subsection, replacing subsection 152(5) (a)(b) gives procedural requirements for operating equipment with booms or similar device near an energized conductor.

The minimum distance requirements of subsection (1) are restated here because of the high hazard of electrical contact due to a change in boom angle. The requirement for a signaller, who has been appointed and does not carry another task which could be a distraction, has been added to ensure that the machine operator observes the minimum distance. These are stipulated as performance standards, in the third subsection.

Subsections (1) and (2) are subject to 3 exemptions:

- (1) as in the existing section, for live work;
- (2) when special equipment is used and special procedures are followed (4th subsection);
- (3) for railroad cranes with movable booms from the minimum distance requirements of subsection 2 when,
 - the machine operator has been authorized
 - the machine operates on tracks; and
 - the conductor is at less than 750 V direct current.

This exemption addresses existing railroad cranes where the engine is fed by a trolley line at less than 750 V direct current. It should be noted that the effects of direct current on the human body are different from those of alternating current and present a lower hazard.

This exemption, specified in subsection 5 replaces clauses (a) and (b) of existing subsection 152(5).

Clause (c) of subsection 152(5) has been deleted as repetitive: a line is not energized if it is disconnected and grounded.

SECTION 153 - LOCK-OUT**Existing:**

153.—(1) All switches controlling electrical equipment or lines shall be locked and tagged in the open position while work is being done on the equipment or lines but the locking device may be omitted where,

- (a) the locking device in itself creates a hazard due to a switch design; or
- (b) circuit breakers or fuses for voltages of less than 150 volts to ground are not equipped with a means of locking.

(2) Notwithstanding subsection (1), locking and tagging is not required where live work is permitted by subsection 152 (1).

(3) A tag required by subsection (1) shall,

- (a) be secured to prevent its inadvertent removal;
- (b) state the reason the switch is opened;
- (c) show the name of the person responsible for opening the switch; and
- (d) show the date on which the switch was opened.

(4) Tags on electrical equipment shall be of non-conducting materials. R.R.O. 1980, Reg. 694, s. 153.

Proposed:

M.5. (1) The power supply to electrical installations, equipment or conductors shall be disconnected, locked and tagged out of service prior to and during any work being done on, or in proximity to, the installations, equipment or conductors.

(2) Where a power supply is required by subsection (1) to be disconnected, each worker doing the work shall ascertain, before commencing work, that the power supply is disconnected.

(3) Notwithstanding subsection (1), locking and tagging out is not required,

- (a) if the locking device in itself creates a hazard due to switch design;**
- (b) if live work is permitted by section 6;**
- (c) if the conductors are effectively grounded with a visible grounding mechanism; or**

- (d) if the voltage is less than 300 volts and there is no locking device for the circuit breakers or fuses.

(4) A tag required by subsection (1) shall,

- (a) be made of non-conducting material;
- (b) be secured to prevent its inadvertent removal;
- (c) state the reason the switch is opened;
- (d) show the name of the person responsible for opening the switch; and
- (e) show the date on which the switch was opened.

Rationale:

Subsection M.5.(3) will provide 4 exemptions from locking out, i.e.:

- where switches cannot be locked out safely: in the mining industry there are open disconnect switches which cannot be locked-out safely due to the proximity of other similar switches, and are not designed for locking out;
- live work;
- visible grounding: it is used mostly in power line work where, because of remote location and higher probability of lightning, locking out is not practical; and
- where the voltage is less than 300V and the equipment is not equipped with a lock out device: the standards of Part II of The Canadian Electrical Code do not require lock-out for all equipment below 300V (e.g. C22.2 No. 29 - M1983 Panelboards and Panelboard Enclosures).

In addition, a new subsection shall be added as M.5.(2) to require that not only the line be de-energized but also be verified to be de-energized prior to working on the line.

The 4th subsection gives tag specifications, including the requirement that tags be non-conductive so as not to present a hazard. Wording is identical to the existing subsections 153(3) and (4). It is considered that tagging is necessary in mining because of the big systems used and change of shifts, and resulting communications problems.

SUBSECTION 152(1) - LIVE WORK

Existing: 152.—(1) Electrical work shall not be performed on live equipment except where,

- (a) live line techniques are used;
- (b) approved live line equipment is used;
- (c) no hazard from explosive or flammable materials exists; and
- (d) all necessary precautions to work safely are taken.

Proposed:

M.6. (1) Subject to subsection (2), where work is to be done on energized electrical equipment or conductor and it is not practicable to disconnect the equipment or conductor from the power supply,

- (a) the work shall be performed by a competent person;
- (b) rubber gloves, mats, shields, electrical shock resistant footwear or other protective equipment and procedures adequate to ensure protection from electrical shocks and burns shall be used while the work is being performed;
- (c) where the equipment or conductor is operating at 300 volts or over but less than 750 volts, a person, other than the worker doing the work, competent to perform rescue operations, including cardiopulmonary resuscitation and suitably equipped, shall be conveniently available while the work is being performed; and
- (d) where the equipment or conductor is operating at 750 volts or over, a person, other than the worker doing the work, competent to perform rescue operations, including cardiopulmonary resuscitation, suitably equipped, and competent in the work to be done, shall be conveniently available while the work is being performed.

(2) Clauses (1)(c) and (d) do not apply to troubleshooting, installing or replacing meters or to the testing of appliances or instruments by competent workers.

Note: Adherence to Canadian Standards Association Standard Z195-M1984 complies with the intent of clause b of subsection 1 regarding electrical shock resistant footwear.

Rationale:

This section stipulates the live work procedures to be followed with additional requirements above 300V and above 750V. The requirement for a stand-by person competent in rescue operations including CPR has been added as electrical shocks may cause cardiac arrests. Comments are invited as to the feasibility and effectiveness of this proposed requirement.

Subsection 2 provides an exemption for work on automobile ignition systems, TV sets, cathode ray tubes and other similar equipment which are not the major source of injuries from electrical contact. Work on meters, which are above 300 volts, does not present a hazard when done by competent workers, and has also been exempted.

SECTION 154 - TOOLS NEAR LIVE CONDUCTOR**Existing:**

154. A portable ladder which has metal or metal reinforced side rails shall not be,

(a) stored in or about electrical equipment having energized and exposed parts; or

(b) used about electrical equipment having energized exposed parts. R.R.O. 1980, Reg. 694, s. 154.

Proposed:

M.7. Except where work is being carried out as permitted by section 6, tools, ladders, scaffolding and other equipment, capable of conducting electricity thereby endangering the safety of anyone, shall not be stored or used in such proximity to any energized electrical installation, equipment or conductor as to make electrical contact with an energized conductor.

Rationale:

The purpose of this section is to prevent electrical contact between conductive equipment and live equipment.

Existing wording has been modified to

- 1) allow exemption for live work procedures, and
- 2) apply the requirements to any conductive equipment rather than ladders only.

SUBSECTION 165(2) - ENTRANCE TO ROOM WITH LIVE PARTS**Existing:**

~~165~~(2) Only authorized persons shall be permitted access to switchboards or switchrooms that contain bare energized parts.

Proposed:

M.8. (1) No person, other than an authorized person, shall enter or be permitted to enter a room or other enclosure containing exposed energized electrical parts.

(2) The entrance to a room or other enclosure containing exposed energized electrical parts shall be marked by conspicuous signs warning of the danger of exposed energized electrical parts and stating that only authorized persons may enter.

Rationale:

This section requires that entrance to rooms with live parts be restricted to authorized persons as in subsection 165(2). Requirement for a sign has been added in order to facilitate compliance with the first subsection.

SECTION 157 - EQUIPMENT GROUNDING

Existing:

157.—(1) Electrical mobile equipment operating at more than 300 volts to ground shall be supplied by a system wherein,

(a) the neutral is grounded through a current limiting device in such a manner as to limit the possible rise of ground fault potential to a maximum of 100 volts to ground; and

(b) ground fault protection is provided.

(2) Electrical mobile equipment in use on the 1st day of October, 1979 may continue to be used notwithstanding that the equipment does not comply with subsection (1) but a program to bring such equipment into compliance with subsection (1) shall be initiated within two years after that date. R.R.O. 1980, Reg. 694, s. 157.

Proposed:

M.9. Electrical mobile equipment operating at more than 300 volts alternating current shall be supplied by a system wherein ground fault protection is provided and the neutral is grounded through a current limiting device in such a manner as to limit the possible rise of ground fault potential to a maximum of 100 volts to ground.

Rationale:

In subsection 157(1) "300 volts to ground" is changed to "300 volts alternating current" to exempt direct current equipment (e.g., equipment on rail).

Subsection 157(2) is deleted because the exemption referred to no longer applies.

SECTION 155 - GROUND FAULT**Existing:**

155.—(1) On each ungrounded utilization system over 300 volts, a device shall be installed for the purpose of indicating ground faults.

(2) A device required by subsection (1) shall be provided with,

(a) short-circuit protection; and

(b) disconnecting means.

(3) A ground fault shall be removed without delay. R.R.O. 1980, Reg. 694, s. 155.

Proposed:

M.10. (1) Where a ground detection device is required, it shall be provided with short-circuit protection and disconnecting means.

(2) A ground fault shall be investigated and removed without delay.

Rationale:

The requirements of subsection 155(1) are covered by The Canadian Electrical Code, Part I, 10-106 (2) and the subsection may be deleted. Subsections 2 and 3 have been reworded accordingly.

SECTION 168 - CABLES IN TUNNELS AND SHAFTS

Existing:

168.—(1) Cables supplying electrical power from surface to underground shall be fed through a circuit breaker located on surface.

(2) Only an authorized person shall be permitted access to the circuit breaker.

(3) No cables shall be spliced in a shaft except for a temporary period where emergency power is required.

(4) Except when supplying electric mobile equipment, cables transmitting power underground shall,

(a) be armoured or protected by metal conduit when operating at over 150 volts to ground; and

(b) have any outer jackets made of material that will not support combustion.

(5) A certificate showing the voltage for which a cable was built shall be obtained by the user for a cable in use in a shaft or underground when operating in excess of 750 volts.

(6) Before installing a cable to be used in a shaft or underground in excess of 750 volts tests shall be conducted on the insulation to determine it is in safe condition for the voltage at which it will be used and a record of such tests shall be kept. R.R.O. 1980, Reg. 694, s. 168.

Proposed:

M.11. (1) Cables supplying electrical power from surface to underground shall be fed through a circuit breaker located on surface.

(2) Only an authorized person shall be permitted access to the circuit breaker.

(3) Except when supplying electrical mobile equipment, cables transmitting power underground shall,

(a) be armoured or protected by metal conduit when operating at over 150 volts to ground; and

(b) be armoured, protected by metal conduit or have an outer covering that will not support combustion and is so identified continually when operating below 150 volts to ground.

(4) Spliced cable shall not be used in a shaft except for a temporary period when emergency power is required.

Note: FT4 as specified in Canadian Standards Association Standard C22.2 No. 131-1986 meets the intent of clause b of subsection 3.

Rationale:

Subsections 168(1), (2), and (4) have been kept without any change. The requirements of subsections 168(5) and (6) for certification and suitability of conductors are now covered in clause (a) of new subsection M.1.(1) and may be deleted.

Subsection (3) is reworded as it is the use of the spliced cable, wherever spliced, rather than the action of splicing the cable, which presents a hazard.

SECTION 150 - EQUIPMENT NO LONGER USED**Existing:**

150. Wiring that is out of service or damaged shall be disconnected and,

- (a) removed; or
- (b) when left in place, have any bare conductors capped. R.R.O. 1980, Reg. 694, s. 150.

Proposed:

M.12. Where electrical equipment or power line is no longer used for the purpose for which it was intended or designed, the electrical equipment or power line shall be isolated, de-energized and,

- (a) removed; or**
- (b) when left in place, locked out.**

Rationale:

The purpose of this section is to protect from the hazard of out of service wiring that could be re-energized without the knowledge of nearby persons.

Existing wording also included damaged wiring. However, this requirement is covered by The Canadian Electrical Code Part I, 2-300(3) & (4) and may be deleted. The section was reworded for clarification.

SECTION 149 - NOTIFICATION OF ELECTRICAL INSTALLATIONS**Existing:**

149. An inspector shall be notified of any intent to make,

- (a) a major electrical installation including the installation of any oil filled transformer in an underground mine;
- (b) an installation of a radio-frequency transmitter;
- (c) a major telephone installation; or
- (d) a major alteration or addition to existing electrical, radio-frequency or telephone installations. R.R.O. 1980, Reg. 694, s. 149.

Proposed:

M.13. An engineer of the Ministry shall be notified, in writing, of any intent to make,

- (a) an installation of electrical equipment which exceeds \$50,000 in total cost of labour and materials;
- (b) an installation of any oil filled transformer in an underground mine;
- (c) an installation of a radio-frequency transmitter;
- (d) an installation of telephone equipment which exceeds \$50,000 in total cost of labour and materials;
- (e) an alteration or addition to existing electrical, radio-frequency or telephone equipment which exceeds \$50,000 in total cost of labour and materials;
- (f) electrical mobile equipment; or
- (g) an underground trolley system utilizing voltages in excess of 300 volts.

Rationale:

This requirement is necessary in mining where the Ministry inspectorate plays a role equivalent to that of Ontario Hydro.

"Inspector" has been changed to "engineer of the Ministry" and "in writing" added so that predevelopment review can be conducted.

Clauses (b) and (c) address fire and explosion hazard respectively. Clauses (a), (d) and (e) address major installations which because of the materials and/or labour may present a hazard. Clauses (f) and (g) address types of work which, regardless of size, may present a hazard.

SUBSECTION 152(4) GUARDING OF ELECTRICAL EQUIPMENT**Existing:**

152. (4) When located less than 1.5 metres measured in a horizontal plane or 2.5 metres measured in a vertical plane from a walkway or landing, any bare part of electrical equipment energized in excess of 150 volts DC or 50 volts AC shall be guarded. O. Reg. 569/83, s. 35.

Proposed: Deleted

Rationale:

The requirements of this subsection are covered adequately as performance standards by The Canadian Electrical Code Part I, 2-200 and 202.

SECTION 158 - CABLE FOR ELECTRIC MOBILE EQUIPMENT

Existing:

158. Every electric cable supplying power to electric mobile equipment shall,

- (a) meet or exceed Insulated Power Cable Engineers Association (IPCEA)—National Electrical Mechanical Manufacturers Association (NEMA) Standards No. S-66-524, S-68-516 or S-19-81;
- (b) be in an assembly that is cabled together;
- (c) be insulated for the voltage level;
- (d) be large enough to carry the maximum design current of the equipment without being overloaded;
- (e) be able to carry any fault currents that may be produced;
- (f) be built for the conditions of use;
- (g) be built to facilitate ground fault protection;
- (h) when over 750 volts have shielding to dissipate inductive charges;
- (i) when in use underground have an outer covering that,
 - (i) will not support combustion, and
 - (ii) is continually identified as having such a covering; and
- (j) be secured and protected against physical damage. R.R.O. 1980, Reg. 694, s. 158.

Proposed:

M.14. Every electric cable supplying power to electric mobile equipment shall,

- (a) meet or exceed the National Standard of Canada CAN3-C68.4 - M86 Portable Power Cables;
- (b) be built to facilitate ground fault protection;
- (c) be in an assembly that is cabled together;
- (d) when over 750 volts, have shielding to dissipate inductive changes;
- (e) when in use underground, have an outer covering that,
 - (i) will not support combustion, and
 - (ii) is continually identified as having such a covering; and
- (f) be secured and protected against physical damage.

Note: FT4 as specified in Canadian Standards Association standard C22.2 No. 131-1986 meets the intent of clause e.

Rationale:

Clause 158(a) is still required because CSA does not certify cables to mobile equipment.

Clauses 158(b) to (f) are covered by the standard referenced in clause (a), the Canadian Electrical Code, and other sections of the mining regulations, and may be deleted.

Clause 158(g) is kept as an additional requirement to 157(1) or new section M.9.

Clauses 158(h) and (i) are kept as additional requirements to the standard specified in clause (a).

Clause 158(j) is kept as a good general performance requirement.

SECTION 159 - TESTING OF PROTECTIVE DEVICES

Existing:

159.—(1) Except for fuses, protective devices for installations that operate in excess of 750 volts shall be tested to determine that the devices are protecting the equipment from being operated in excess of its design capabilities before initial use and after each three years of use.

(2) The results of the tests required by subsection (1) shall be recorded in a record book. R.R.O. 1980, Reg. 694, s. 159.

Proposed: No change

M.15. (1) Except for fuses, protective devices for installations that operate in excess of 750 volts shall be tested to determine that the devices are protecting the equipment from being operated in excess of its design capabilities before initial use and every three years thereafter.

(2) The results of the tests required by subsection (1) shall be recorded in a record book.

Rationale:

As worded, the section addresses primarily equipment protection, and only indirectly (once wiring would get hot and melt) worker's protection. The intent re worker's protection of this section is covered by clause 14(1)(b) of the Occupational Health and Safety Act and by The Canadian Electrical Code Part I, 14-104 and Table 13. However, subsection 159(1) is to be retained because the Mining Health & Safety Branch is the utility authority for mines. Subsection 159(2) is to be retained to facilitate enforcement of the first subsection.

SECTION 160 - SINGLE POLE DISCONNECT**Existing:**

160. Clause 36-204 of CSA Standard C 22.1-1975 is modified to the extent that a single pole disconnecting fuse of adequate interrupting capacity may be used to protect a transformer whose capacity is 100 kilovolt-amperes per phase or less when operating at a voltage less than 7,500 volts. R.R.O. 1980, Reg. 694, s. 160.

Proposed:

M.16. Clause 36-204 of CSA Standard C 22.1-1982 is modified to the extent that a single pole disconnecting fuse of adequate interrupting capacity may be used to protect a transformer whose capacity is 100 kilovolt-amperes per phase or less when operating at a voltage less than 7,500 volts and which was installed and in use before the day that is ninety days after the day this Regulation is filed with the Registrar of Regulations.

Rationale:

This section allows an exemption to CSA Standard C22.1-1982: (that single pole disconnects be used for 3-phase transformers) as a "grandfather clause". New installations must conform to CSA standard. The 90 days period allows for equipment designed or purchased prior to filing of the regulation to be installed.

SECTION 161 – KNIFE SWITCHES**Existing:**

161. Identifying barriers shall be provided between circuits where more than one set of single pole, open blade type isolating switches are installed adjacent to each other. R.R.O. 1980, Reg. 694, s. 161.

Proposed: No change

M.17. Identifying barriers shall be provided between circuits where more than one set of single pole, open blade type isolating switches are installed adjacent to each other.

Rationale:

This section is covered by The Canadian Electrical Code Part I, 26-100 regarding identification. The Canadian Electrical Code Part I, 12-3036(1)(a) gives barrier specifications which would be sufficient for industries where the use of knife switches is decreasing.

However, this section should be kept for mining as it is well accepted and easy to enforce.

SECTION 162 - DISCONNECT**Existing:**

162.—(1) Each circuit operating at over 300 volts shall have a means by which it can be disconnected from its source of power.

(2) The means referred to in subsection (1) shall,

(a) be as close as practical to its source of power supply; and

(b) when in the opened position provide a separation between the fixed and movable current carrying parts that is readily visible.

R.R.O. 1980, Reg. 694, s. 162.

Proposed: No Change.

M.18. (1) Each circuit operating at over 300 volts shall have a means by which it can be disconnected from its source of power.

(2) The means referred to in subsection (1) shall,

(a) be as close as practical to its source of power supply; and

(b) when in the opened position provide a separation between the fixed and moveable current carrying parts that is readily visible.

Rationale:

The requirement of section 162 to have disconnecting means for circuits over 300 volts is covered by The Canadian Electrical Code Part I, 14-010(b). However, the requirement that the breaker show a visible separation when in the opened position is still considered necessary to facilitate verification of isolation in mining and the entire section 162 should be retained as subsection 2 cannot stand alone.

SECTION 163 - MOTOR DISCONNECT**Existing:**

163.—(1) The power supply to a motor shall not be run through the enclosure of the controller for another motor.

(2) A motor branch circuit shall be arranged so that when its disconnecting means is opened, all parts on the load side within the controller enclosure are de-energized. R.R.O. 1980, Reg. 694, s. 163.

Proposed:

M.19. A motor branch circuit shall be arranged so that when its disconnecting means is opened, all parts within the controller enclosure, except on the line side, are de-energized.

Rationale:

New section M.5. gives a performance standard for disconnecting motor branch circuits. Section 163 goes further by prohibiting connections of more than one motor through the same controller, in which case dispatcher wiring may still be live after the motor is disconnected.

Subsection 163(1) is covered by The Canadian Electrical Code Part I, 12-3038(1) and may be deleted.

Subsection 163(2) is to be retained as is, an operating rather than design requirement: when a motor branch circuit is opened, all parts within the enclosure must be de-energized.

SECTION 169 - GROUNDING CONDUCTOR**Existing:**

169. Where an internal grounding conductor or the armouring or casing of cables underground does not provide a grounding circuit of adequate size, a non-corrosive grounding conductor of adequate size shall be run from such equipment to a grounding point on surface. R.R.O. 1980, Reg. 694, s. 169.

Proposed: No change

M.20. Where an internal grounding conductor or the armouring or casing of cables underground does not provide a grounding circuit of adequate size, a non-corrosive grounding conductor of adequate size shall be run from such equipment to a grounding point on surface.

Rationale:

The requirements of this section are covered by The Canadian Electrical Code Part I, 10 which requires adequate grounding and gives size requirement in Table 7 but should be kept in mining because it is easy to enforce and accommodates old installations.

SECTION 170 – JUNCTION BOXES**Existing:**

170. Junction boxes for a cable transmitting power at a potential exceeding 300 volts shall not be located in a shaft or directly attached to any timber at a shaft station or headframe. R.R.O. 1980, Reg. 694, s. 170.

Proposed: No change

M.21. Junction boxes for a cable transmitting power at a potential exceeding 300 volts shall not be located in a shaft or directly attached to any timber at a shaft station or headframe.

Rationale:

Junction boxes present a fire hazard (e.g. short circuit).

SECTION 171 - TELEPHONE CABLES**Existing:**

171. Unarmoured signal and telephone cables shall be prevented from coming into contact with electrical equipment. R.R.O. 1980, Reg. 694, s. 171.

Proposed:

M.22. The outer jackets of signal and telephone cables in new installations in underground mines shall be of non combustion supporting material.

Rationale:

The existing section, a difficult operating procedure to enforce, is replaced by a design requirement to prevent fire hazards.

SECTION 172 - UNDERGROUND LIGHTING CIRCUIT**Existing:**

172. The voltage of any underground lighting circuit shall not exceed 150 volts to ground except in circuits using direct current where the voltage shall not exceed 300 volts to ground. R.R.O. 1980, Reg. 694, s. 172.

Proposed:

M.23. The voltage of an underground lighting circuit shall not exceed 150 volts alternating current or 300 volts direct current.

Rationale:

Lighting systems should be kept at a low voltage since this is an electrical system on which workers with no electrical training do maintenance work. This requirement may make difficult the installation of a full lighting system, if and when it becomes mandatory.

SECTION 173 - UNDERGROUND TROLLEY LINES**Existing:**

173. In an underground mine trolley lines shall,
- (a) be at an elevation greater than 1.8 metres above grade;
 - (b) operate at a potential not exceeding 300 volts to ground; and
 - (c) be guarded against inadvertent contact by a worker. R.R.O. 1980, Reg. 694, s. 173.

Proposed:

M.24. In an underground mine, trolley lines shall,

- (a) be at an elevation greater than 1.8 metres above grade;**
- (b) operate at a potential not exceeding 300 volts; and**
- (c) be guarded against inadvertent contact by anyone.**

Rationale:

Trolley lines should be kept at low voltage since non-electrical workers use the same passageway as the trolley locomotive and could come in contact with the trolley lines. The requirements of this section protect workers from such hazard.

NEW SECTION - ELECTRICAL UTILITY WORK**Existing:** Nil**Proposed:**

1. X. "electrical utility work" means work performed to install, modify and maintain electrical equipment and conductors rated at more than 750 volts; and
 - X. "hold-off" means a procedure to establish a method to prohibit re-energizing of apparatus or circuits under this protection.
- M.25.** (1) Electrical utility work shall be carried out by a private or public electrical utility or an electrical utility contractor qualified to perform the work and approved by the utility.
- (2) The work shall be performed only by,
- (a) a competent person who has been designated as a journeyman-lineman by the utility, or
 - (b) a competent person who is continuously supervised by a designated journeyman-lineman.
- (3) Rubber gloves, insulating blankets and other protective equipment and devices shall be adequate to protect the worker from electrical hazards and shall be dielectrically tested as recommended by the manufacturer.
- (4) Work on or in close proximity to energized electrical conductors apparatus or equipment shall be done only under the protection of a hold-off.
- (5) Work in close proximity to energized electrical conductors, apparatus or equipment at the voltage specified in column 1 shall be done outside the minimum distance specified in column 2 of,
- (a) Table I when the work is done by a worker under the supervision of a designated journeyman-lineman,
 - (b) Table II when the work is done by a designated journeyman-lineman, or
 - (c) Table III when the work is done using earth augers, radial boom or pole derricks.

TABLE I

Column 1 Conductor Voltage	Column 2 Minimum Distance
750 to 15,000 volts	0.6 metre
over 15,000 to 35,000 volts	0.9 metre
over 35,000 to 50,000 volts	1.2 metres
over 50,000 to 150,000 volts	1.5 metres
over 150,000 to 350,000 volts	2.1 metres
over 350,000 volts	3.6 metres

TABLE II

Column 1 Conductor Voltage	Column 2 Minimum Distance (journeyman–lineman)
750 to 15,000 volts	0.3 metre
over 15,000 to 35,000 volts	0.45 metre
over 35,000 to 150,000 volts	0.6 metre
over 50,000 to 150,000 volts	0.9 metre
over 150,000 to 350,000 volts	1.2 metres
over 350,000 volts	2.7 metres

TABLE III

Column 1 Conductor Voltage	Column 2 Minimum Distance (Earth Augers, Radial Boom and Pole Derricks)
750 to 35,000 volts	0.9 metre
over 35,000 to 50,000 volts	1.2 metres
over 50,000 to 350,000 volts	3.0 metres
over 350,000 volts	6.0 metres

Rationale:

The mining plants own and operate their internal utility systems. They are responsible for maintenance and cleaning of their lines and insulations. Their conductors include power generating plants, through right-of-way land, to building supply. Mining plants employ linemen for their designated work responsibilities. The Electrical Utility Work sections developed for the Construction Sector and which are relevant to mining plants as noted above have been adopted.

APPENDIX I

PROPOSED REVISIONS TO REGULATIONS
ADDRESSING ELECTRICAL HAZARDS -

A COMPARISON BETWEEN CONSTRUCTION, INDUSTRIAL AND MINING REGULATIONS

ELECTRICAL EQUIPMENT AND INSTALLATIONS

CONSTRUCTION
(s. 100)

- C.1. (1) Electrical equipment, power lines and insulating materials shall,
- (a) be suitable for its or their use, and
- (b) only be installed, maintained, modified or operated in such a manner as not to present a hazard to a worker.
- (2) Only a competent person who is an electrician certified under the Apprenticeship and Tradesmen's Qualification Act or a competent person who is equivalently qualified by training and experience shall install, maintain, or modify electrical equipment or installations.

- (3) Except where the connection is made by inserting an attachment plug cap on the cord of the electrical equipment or tool into a convenience receptacle, only a worker who has qualifications referred to in subsection (2) shall connect any electrical equipment or tool to a power source or disconnect any electrical equipment or tool from a power source.

INDUSTRIAL
(s. 44)

- I.1. Electrical equipment, power lines and insulating materials shall,
- (a) be suitable for its or their use, and
- (b) only be installed, maintained, modified or operated in such a manner as not to present a hazard to a worker.

Note: The requirements of the Electrical Safety Code made under the Power Corporation Act apply to electrical equipment and installations.

MINING
(ss. 148(1) & (2), 166(1), (2) & (3)(a))

- M.1. (1) Electrical equipment, conductors and insulating materials,
- (a) shall not be installed or used,
- (i) unless suitable for its or their use, and
- (ii) unless certified by the Canadian Standards Association, the Ontario Hydro Electrical Inspection Department, or an engineer of the Ministry, and
- (b) shall be installed, modified and maintained by a competent person according to the standards of Part I of The Canadian Electrical Code, CSA Standard C22.1 - 1982, "Safety Standards for Electrical Installations", unless otherwise provided in this Regulation.
- (2) Notwithstanding subsection (1), Part V of The Canadian Electrical Code does not apply to electrical installations and equipment in mines and mining plants.

CONSTRUCTION
(s. 100)

Note: The requirements of the Electrical Safety Code made under the Power Corporation Act apply to electrical equipment and installations on construction projects.

INDUSTRIAL
(s. 44)

MINING
(ss. 148(1) & (2), 166 (1), (2) & (3)(a))

(3) The installations of electrical supply, communications, railway signal and trolley lines shall meet the standards set out in Part III of The Canadian Electrical Code, CSA Standard C22.3 No.1, 1976 "Overhead Systems and Underground Systems".

Note: The requirements of the Canadian Transport Commission apply to electrical supply conductors carried over public railways or over or under navigable waters.

LIQUID IN ELECTRICAL EQUIPMENT

CONSTRUCTION

INDUSTRIAL

MINING

(ss. 148(3))

M.2. If any electrical equipment contains more than one litre of liquid insulant or coolant, the quantity and trade name of the insulant or coolant shall be shown on the name plate of the electrical equipment in which it is contained.

COMPETENT PERSON APPOINTED

CONSTRUCTION

INDUSTRIAL

MINING
(ss. 148(4))

M.3. A competent person shall be appointed to be in charge of electrical installations, equipment and working procedures.

TEMPORARY INSTALLATIONS/LIGHTING

CONSTRUCTION
(new)

C.2. A light bulb used in temporary lighting systems shall be enclosed by a mechanical protective device.

INDUSTRIAL

MINING
(s. 151)

deleted

REASONABLE PRECAUTIONS

CONSTRUCTION
(new)

C.3. Every reasonable precaution shall be taken to prevent a hazard to a worker from an energized electrical conductor or equipment.

INDUSTRIAL

MINING

WORK IN PROXIMITY TO OVERHEAD CONDUCTORS

CONSTRUCTION
(s. 105)

C.4. (1) Except as provided in subsection (4) and in section 6, no object, including any equipment, or any part thereof, shall be brought closer to an energized outdoor overhead electric conductor of the voltage set out in column 1 of the following Table than the distance specified opposite thereto in column 2:

TABLE

Column 1 Conductor Voltage	Column 2 Minimum Distance
750 to 150,000 volts over 150,000 to 250,000 volts over 250,000 volts	3 metres 4.5 metres 6 metres

(2) Except as provided in subsection (4) and section 6, where a crane, hoisting device, back-hoe, power shovel or vehicle or any other equipment is operated near an energized outdoor overhead electric conductor and it is possible for any part of the equipment or its load to encroach on the minimum distance required by subsection (1), or when the hoisting device is positioned closer than the length of the boom of the hoisting device to an energized outdoor overhead electrical conductor,

INDUSTRIAL
(s. 64)

I.2. (1) Except as provided in subsection (4) and in section 4, no object including any equipment, or any part thereof, shall be brought closer to an energized outdoor overhead electric conductor of the voltage set out in column 1 of the following Table than the distance specified opposite thereto in column 2:

TABLE

Column 1 Conductor Voltage	Column 2 Minimum Distance
750 to 150,000 volts over 150,000 to 250,000 volts over 250,000 volts	3 metres 4.5 metres 6 metres

(2) Except as provided in subsection (4) and section 4, where a crane, hoisting device, back-hoe, power shovel or vehicle or any other equipment is operated near an energized outdoor overhead electric conductor and it is possible for any part of the equipment or its load to encroach on the minimum distance required by subsection (1),

MINING
(ss. 152(2), (3) & (5))

M.4. (1) Except as provided in subsections (4) and (5), and in section 6, no object, including any equipment, or any part thereof, shall be brought closer to an energized outdoor overhead electric conductor of the voltage set out in column 1 of the following Table than the distance specified opposite thereto in column 2:

TABLE

Column 1 Conductor Voltage	Column 2 Minimum Distance
300 to 150,000 volts over 150,000 to 250,000 volts over 250,000 volts	3 metres 4.5 metres 6 metres

(2) Except as provided in subsections (4) and (5), and in section 6, where a crane, hoisting device, back-hoe, power shovel or vehicle or any other equipment is operated near an energized outdoor overhead electric conductor and it is possible for any part of the equipment or its load to encroach on the minimum distance required by subsection (1),

WORK IN PROXIMITY TO OVERHEAD CONDUCTORS(Cont'd.)

CONSTRUCTION
(s. 105)

INDUSTRIAL
(s. 64)

MINING
(ss. 152(2), (3) & (5))

- | | | | |
|------|--|------|--|
| (a) | a legible sign, clearly visible to the operator and warning of the potential electrical hazard, shall be posted at the operator's station; and | (a) | a legible sign, clearly visible to the operator and warning of the potential electrical hazard, shall be posted at the operator's station; and |
| (b) | a person who is designated to be a signaller shall be stationed, | (b) | a person who is designated to be a signaller shall be stationed, |
| (i) | in full view of the operator, and | (i) | in full view of the operator, and |
| (ii) | with a clear view of the equipment and the power line, | (ii) | with a clear view of the equipment and the power line, |
| | to warn the operator each time any part of the equipment or its load may approach such minimum distance. | | to warn the operator each time any part of the equipment or its load may approach such minimum distance. |
| (3) | Section 130 applies with necessary modifications where a signaller is required under subsection (2). | (3) | The signaller required by subsection (2), |
| | | (a) | shall be a competent person; |
| | | (b) | shall perform no other work while carrying out the assigned duties of a signaller; and |
| | | (c) | shall communicate with the operator of the equipment, |

WORK IN PROXIMITY TO OVERHEAD CONDUCTORS (Cont'd.)

CONSTRUCTION
(s. 105)

INDUSTRIAL
(s. 64)

MINING
(ss. 152(2), (3) & (5))

- | | |
|--|--|
| <p>(4) Subsection (1) does not apply where,</p> <p>(a) mats, shields or other protective devices adequate to ensure protection from electrical shocks and burns have been installed under the authority of the owner of the conductor or equipment; and</p> <p>(b) the person who is bringing the object or equipment or is causing the object or equipment to be brought within the minimum distance is using procedures adequate to insure protection from electrical shock and burns and is a competent person.</p> | <p>(4) Subsection (1) does not apply where,</p> <p>(a) mats, shields or other protective devices adequate to ensure protection from electrical shocks and burns have been installed under the authority of the owner of the conductor or equipment; and</p> <p>(b) the person who is bringing the object or equipment or is causing the object or equipment to be brought within the minimum distance is using procedures adequate to insure protection from electrical shock and burns and is a competent person.</p> |
| <p>(i) by the use of prearranged visual signals, when conditions are such that the signals are clearly visible to the operator; or</p> <p>(ii) by the use of a telecommunications system when visual signals are not practical.</p> | <p>(i) by the use of prearranged visual signals, when conditions are such that the signals are clearly visible to the operator; or</p> <p>(ii) by the use of a telecommunications system when visual signals are not practical.</p> |

WORK IN PROXIMITY TO OVERHEAD CONDUCTORS(Cont'd.)

CONSTRUCTION
(s. 105)

INDUSTRIAL
(s. 64)

MINING
(ss. 152(2), (3) & (5))

- (5) A crane operating on railroad tracks may encroach on the minimum distances specified under subsection (1) without complying with subsection (2),
- (a) if the energized outdoor overhead electric conductor is used for railway power at less than 750 volts direct current; and
 - (b) if when the crane is being used, the operator has been authorized to use it.

LOCK-OUT

CONSTRUCTION

(ss. 104(1), clauses 102 (f),(g),(h))

C.5. (1) The power supply to electrical installations, equipment or power lines shall be disconnected, locked and tagged out of service prior to and during any work being done on, or in proximity to, the installations, equipment or power lines.

(2) Where a power supply is required by subsection (1) to be disconnected, each worker doing the work shall ascertain, before commencing work, that the power supply is disconnected.

(3) Notwithstanding subsection (1), locking out and tagging are not required,

- (a) if live work is permitted by section 6;
- (b) if the power lines are effectively grounded with a visible grounding mechanism; or
- (c) if the voltage is less than 300 volts and there is no locking device for the circuit breakers or fuses.

INDUSTRIAL

(ss. 46(1))

I.3. (1) The power supply to electrical installations, equipment or power lines shall be disconnected, locked and tagged out of service prior to and during any work being done on, or in proximity to, the installations, equipment or power lines.

(2) Where a power supply is required by subsection (1) to be disconnected, each worker doing the work shall ascertain, before commencing work, that the power supply is disconnected.

(3) Notwithstanding subsection (1), locking out and tagging are not required,

- (a) if live work is permitted by section 4;
- (b) if the power lines are effectively grounded with a visible grounding mechanism; or
- (c) if the voltage is less than 300 volts and there is no locking device for the circuit breakers or fuses.

MINING

(s. 153)

M.5. (1) The power supply to electrical installations, equipment or conductors shall be disconnected, locked and tagged out of service prior to and during any work being done on, or in proximity to, the installations, equipment or conductors.

(2) Where a power supply is required by subsection (1) to be disconnected, each worker doing the work shall ascertain, before commencing work, that the power supply is disconnected.

(3) Notwithstanding subsection (1), locking and tagging out are not required,

- (a) if the locking device in itself creates a hazard due to switch design;
- (b) if live work is permitted by section 6;
- (c) if the conductors are effectively grounded with a visible grounding mechanism; or
- (d) if the voltage is less than 300 volts and there is no locking device for the circuit breakers or fuses.

LOCK-OUT (Cont'd)

CONSTRUCTION

(ss. 104(1), clauses 102 (f), (g), (h))

- (4) A tag required by subsection (1) shall,
- (a) be made of non-conducting material;
 - (b) be secured to prevent its inadvertent removal;
 - (c) state the reason the switch is opened;
 - (d) show the name of the person responsible for opening the switch; and
 - (e) show the date on which the switch was opened.

INDUSTRIAL

(ss. 46(1))

- (4) A tag required by subsection (1) shall,
- (a) be made of non-conducting material;
 - (b) be secured to prevent its inadvertent removal;
 - (c) state the reason the switch is opened;
 - (d) show the name of the person responsible for opening the switch; and
 - (e) show the date on which the switch was opened.

MINING

(s. 153)

- (4) A tag required by subsection (1) shall,
- (a) be made of non-conducting material;
 - (b) be secured to prevent its inadvertent removal;
 - (c) state the reason the switch is opened;
 - (d) show the name of the person responsible for opening the switch; and
 - (e) show the date on which the switch was opened.

LIVE WORK

CONSTRUCTION
(ss. 104(2))

INDUSTRIAL
(ss. 46(2) & (3))

MINING
(ss. 152(1))

C.6.	(1) Subject to subsection (2), where work is to be done on energized electrical equipment or conductor, and it is not practicable to disconnect the equipment or conductor from the power supply,	I.4.	(1) Subject to subsection (2), where work is to be done on energized electrical equipment or conductor, and it is not practicable to disconnect the equipment or conductor from the power supply,	M.6.	(1) Subject to subsection (2), where work is to be done on energized electrical equipment or conductor and it is not practicable to disconnect the equipment or conductor from the power supply,
	(a) the work shall be performed by a competent person who has the qualifications referred to in subsection 2 of section 1;		(a) the work shall be performed by a competent person;		(a) the work shall be performed by a competent person;
	(b) rubber gloves, mats, shields, and electrical shock resistant footwear, or other protective equipment and procedures adequate to ensure protection from electrical shocks and burns shall be used while the work is being performed;		(b) rubber gloves, mats, shields and electrical shock resistant footwear, or other protective equipment and procedures adequate to ensure protection from electrical shocks and burns shall be used while the work is being performed;		(b) rubber gloves, mats, shields and electrical shock resistant footwear, or other protective equipment and procedures adequate to ensure protection from electrical shocks and burns shall be used while the work is being performed;
	(c) where the equipment or conductor is operating at 300 volts or over but less than 750 volts, a person, other than the worker doing the work, competent to perform rescue operations, including cardiopulmonary resuscitation and suitably equipped, shall be conveniently available while the work is being performed; and		(c) where the equipment or conductor is operating at 300 volts or over but less than 750 volts, a person, other than the worker doing the work, competent to perform rescue operations, including cardiopulmonary resuscitation and suitably equipped, shall be conveniently available while the work is being performed; and		(c) where the equipment or conductor is operating at 300 volts or over but less than 750 volts, a person, other than the worker doing the work, competent to perform rescue operations, including cardiopulmonary resuscitation and suitably equipped, shall be conveniently available while the work is being performed; and

CONSTRUCTION
(ss. 104(2))

(d) where the equipment or conductor is operating at 750 volts or over, a person, other than the worker doing the work, competent to perform rescue operations, including cardiopulmonary resuscitation, suitably equipped and competent in the work to be done, shall be conveniently available while the work is being performed.

(2) Clauses (1)(c) and (d) do not apply to trouble-shooting, installing or replacing meters or to the testing of appliances or instruments by competent workers.

Note: Adherence to Canadian Standards Association standard Z195-M1984 complies with the intent of clause b of subsection 1 regarding electrical shock resistant footwear.

INDUSTRIAL
(ss. 46(2) & (3))

(d) where the equipment or conductor is operating at 750 volts or over, a person, other than the worker doing the work, competent to perform rescue operations, including cardiopulmonary resuscitation, suitably equipped and competent in the work to be done, shall be conveniently available while the work is being performed.

(2) Clauses (1)(c) and (d) do not apply to trouble-shooting, installing or replacing meters or to the testing of appliances or instruments by competent workers.

Note: Adherence to Canadian Standards Association standard Z195-M1984 complies with the intent of clause b of subsection 1 regarding electrical shock resistant footwear.

MINING
(ss. 152(1))

(d) where the equipment or conductor is operating at 750 volts or over, a person, other than the worker doing the work, competent to perform rescue operations, including cardiopulmonary resuscitation, suitably equipped and competent in the work to be done, shall be conveniently available while the work is being performed.

(2) Clauses (1)(c) and (d) do not apply to trouble-shooting, installing or replacing meters or to the testing of appliances or instruments by competent workers.

Note: Adherence to Canadian Standards Association standard Z195-M1984 complies with the intent of clause b of subsection 1 regarding electrical shock resistant footwear.

CONSTRUCTION
(clause 68(c))

C.7. Except where work is being carried out as permitted by section 6, tools, ladders, scaffolding and other equipment, capable of conducting electricity thereby endangering the safety of anyone, shall not be stored or used in such proximity to any energized electrical installation, equipment or conductor as to make electrical contact with an energized conductor.

I.5. Except where work is being carried out as permitted by section 4, tools, ladders, scaffolding and other equipment, capable of conducting electricity thereby endangering the safety of anyone, shall not be stored or used in such proximity to any energized electrical installation, equipment or conductor as to make electrical contact with an energized conductor.

INDUSTRIAL
(s. 47)

M.7. Except where work is being carried out as permitted by section 6, tools, ladders, scaffolding and other equipment, capable of conducting electricity thereby endangering the safety of anyone, shall not be stored or used in such proximity to any energized electrical installation, equipment or conductor as to make electrical contact with an energized conductor.

MINING
(s. 154)

CONSTRUCTION
(Clause 17(2)(f))

INDUSTRIAL
(s. 45)

MINING
(ss. 165(2))

- C.8. (1) No person, other than a person authorized to do so by the supervisor in charge of the work, shall enter or be permitted to enter a room or other enclosure containing exposed energized electrical parts.
- (2) The entrance to a room or other enclosure containing exposed energized electrical parts shall be marked by conspicuous signs warning of the danger of exposed energized electrical parts and stating that only persons authorized by the supervisor in charge of the work may enter.

- I.6. (1) No person, other than a person authorized to do so by the supervisor in charge of the work, shall enter or be permitted to enter a room or other enclosure containing exposed energized electrical parts.
- (2) The entrance to a room or other enclosure containing exposed energized electrical parts shall be marked by conspicuous signs warning of the danger of exposed energized electrical parts and stating that only persons authorized by the supervisor in charge of the work may enter.

- M.8. (1) No person, other than an authorized person, shall enter or be permitted to enter a room or other enclosure containing exposed energized electrical parts.
- (2) The entrance to a room or other enclosure containing exposed energized electrical parts shall be marked by conspicuous signs warning of the danger of exposed energized electrical parts and stating that only authorized persons may enter.

PANEL BOARDS AND SWITCHES

98

CONSTRUCTION

(s. 101 & 102)

INDUSTRIAL

MINING

C.9. (1) Every switch and temporary panel board controlling a service entrance, service feeder or branch circuit shall be,

(a) securely mounted on a vertical surface of sound construction;

(b) kept clear of any obstruction in front of the panel board;

(c) within easy reach of and readily accessible to workers;

(d) located in an area where water will not accumulate; and

(e) provided with a cover over uninsulated parts carrying current.

(2) Every switch controlling a service entrance, service feeder or branch circuit shall,

(a) not be locked in the closed position;

(b) be provided with a device for locking the switch in the open position; and

CONSTRUCTION

(s. 101 & clauses 102 (a) to (e))

INDUSTRIAL

MINING

- (c) over uninsulated parts carrying current, be provided with a cover with a locking device that is,
 - (i) effective when the switch is in both the open and closed position, and
 - (ii) locked when the switch is in the closed position.

EQUIPMENT GROUNDING

CONSTRUCTION
(s. 103 & 199)

C.10. (1) Subject to subsections (2) and (3), any cord-connected electrical equipment or tool shall have a casing which is effectively grounded.

(2) Subsection (1) does not apply to any cord-connected electrical equipment or tool that is effectively double-insulated and that does not show any evidence of cracks or defects in the insulated casing.

(3) Subsection (1) does not apply where a portable electric generator is used in a location where the equipment is not exposed to an external electrical power source and where the non-current carrying parts of the generator are bonded to the casing of portable electrical tools connected to the generator.

Deleted.

INDUSTRIAL
(s. 48)

MINING
(s. 157)

M.9. Electrical mobile equipment operating at more than 300 volts alternating current shall be supplied by a system wherein ground fault protection is provided and the neutral is grounded through a current limiting device in such a manner as to limit the possible rise of ground fault potential to a maximum of 100 volts to ground.

GROUND FAULT

CONSTRUCTION
(new)

INDUSTRIAL
(new)

MINING
(s.155)

C.11. Portable electrical tools, when used in wet locations, shall be protected by a ground fault circuit interrupter.

I.7. Portable electrical tools, when used in wet locations, shall be protected by a ground fault circuit interrupter.

C.12. Where there is an indication of a ground fault which could present a hazard to persons, the ground fault shall be investigated and removed without delay.

I.8. Where there is an indication of a ground fault which could present a hazard to persons, the ground fault shall be investigated and removed without delay.

M.10. (1) Where a ground detection device is required, it shall be provided with short-circuit protection and disconnecting means.

(2) A ground fault shall be investigated and removed without delay.

CABLES IN TUNNELS AND SHAFTS

CONSTRUCTION
(s. 186(2))

- C.13. (2) Electrical cable shall not be taken or used underground unless,
- (a) it is armoured or protected by metal conduit when operating at over 150 volts to ground; and
 - (b) it is armoured, protected by metal conduit or has an outer covering that will not support combustion and is so identified continually when operating below 150 volts to ground.
- (3) Gas hose shall not be taken or used underground unless
- (a) it is armoured or protected by metal conduit; and
 - (b) it has an outer covering that will not support combustion and is so identified continually.
- (4) Spliced cable shall not be used in a shaft except for a temporary period where emergency power is required.

INDUSTRIAL

MINING
(s. 168)

- M.11. (1) Cables supplying electrical power from surface to underground shall be fed through a circuit breaker located on surface.
- (2) Only an authorized person shall be permitted access to the circuit breaker.
- (3) Except when supplying electrical mobile equipment, cables transmitting power underground shall,
- (a) be armoured or protected by metal conduit when operating at over 150 volts to ground; and
 - (b) be armoured, protected by metal conduit or have an outer covering that will not support combustion and is so identified continually, when operating below 150 volts to ground.
- (4) Spliced cable shall not be used in a shaft except for a temporary period when emergency power is required.

CONSTRUCTION
(s. 186)

Note: FT4 as specified in Canadian Standards Association standard C22.2 No. 131-1986 meets the intent of clause b of subsections 2 and 3.

INDUSTRIAL

MINING
(s. 168)

Note: FT4 as specified in Canadian Standards Association standard C22.2 No. 131-1986 meets the intent of clause b of subsection 3.

GROUND FAULT IN TUNNELS AND SHAFTS

104

CONSTRUCTION

(s.198)

C.14. Cord-connected portable electrical tools, pumps and machinery used in a tunnel or a shaft shall be protected by a ground fault circuit interrupter.

INDUSTRIAL

MINING

CONSTRUCTION
(new)

C.15. Where electrical equipment or power line is no longer used for the purpose for which it was intended or designed, the electrical equipment or power line shall be isolated, de-energized and,

(a) removed; or

(b) when left in place, locked out.

INDUSTRIAL
(new)

I.9. Where electrical equipment or power line is no longer used for the purpose for which it was intended or designed, the electrical equipment or power line shall be isolated, de-energized and,

(a) removed; or

(b) when left in place, locked out.

MINING
(s. 150)

M.12. Where electrical equipment or power line is no longer used for the purpose for which it was intended or designed, the electrical equipment or power line shall be isolated, de-energized and,

(a) removed; or

(b) when left in place, locked out.

NOTIFICATION OF ELECTRICAL INSTALLATIONS

CONSTRUCTION

INDUSTRIAL

MINING
(s. 149)

M.13. An engineer of the Ministry shall be notified, in writing, of any intent to make,

- (a) an installation of electrical equipment which exceeds \$50,000 in total cost of labour and materials;
- (b) an installation of any oil filled transformer in an underground mine;
- (c) an installation of a radio-frequency transmitter;
- (d) an installation of telephone equipment which exceeds \$50,000 in total cost of labour and materials;
- (e) an alteration or addition to existing electrical, radio-frequency or telephone equipment which exceeds \$50,000 in total cost of labour and materials.
- (f) electrical mobile equipment; or
- (g) an underground trolley system utilizing voltages in excess of 300 volts.

GUARDING OF ELECTRICAL EQUIPMENT

CONSTRUCTION

INDUSTRIAL

MINING
(ss. 152(4))

deleted

CONSTRUCTION

INDUSTRIAL

MINING
(s. 158)

M.14. Every elec ic cable supplying power to electric mobile equipment shall,

- (a) meet or exceed the National Standard of Canada CAN3-C68.4-M86 Portable Power Cables;
- (b) be built to facilitate ground fault protection;
- (c) be in an assembly that is cabled together;
- (d) when over 750 volts, have shielding to dissipate inductive changes;
- (e) when in use underground, have an outer covering that,
 - (i) will not support combustion, and
 - (ii) is continually identified as having such a covering; and
- (f) be secured and protected against physical damage.

Note: FT4 as specified in Canadian Standards Association Standard C22.2 No. 131-1986 meets the intent of clause ~~e~~.

TESTING OF PROTECTIVE DEVICES

CONSTRUCTION

INDUSTRIAL

MINING
(s. 159)

- M.15. (1) Except for fuses, protective devices for installations that operate in excess of 750 volts shall be tested to determine that the devices are protecting the equipment from being operated in excess of its design capabilities before initial use and every three years thereafter.
- (2) The results of the tests required by subsection (1) shall be recorded in a record book.

CONSTRUCTION

INDUSTRIAL

MINING

(s. 160)

M.16. Clause 36-204 of CSA Standard C 22.1-1982 is modified to the extent that a single pole disconnecting fuse of adequate interrupting capacity may be used to protect a transformer whose capacity is 100 kilovolt-amperes per phase or less when operating at a voltage less than 7,500 volts and which was installed and in use before the day that is ninety days after the day this Regulation is filed with the Registrar of Regulations.

M.17. Identifying barriers shall be provided between circuits where more than one set of single pole, open blade type isolating switches are installed adjacent to each other.

DISCONNECT

CONSTRUCTION

INDUSTRIAL

MINING
(s. 162)

- M.18. (1) Each circuit operating at over 300 volts shall have a means by which it can be disconnected from its source of power.
- (2) The means referred to in subsection (1) shall,
- (a) be as close as practical to its source of power supply; and
- (b) when in the opened position provide a separation between the fixed and moveable current carrying parts that is readily visible.

MOTOR DISCONNECT

(s. 163)

- M.19. A motor branch circuit shall be arranged so that when its disconnecting means is opened, all parts within the controller enclosure, except on the line side, are de-energized.

GROUNDING CONDUCTOR

CONSTRUCTION

INDUSTRIAL

MINING
(s. 169)

M.20. Where an internal grounding conductor or the armouring or casing of cables underground does not provide a grounding circuit of adequate size, a non-corrosive grounding conductor of adequate size shall be run from such equipment to a grounding point on surface.

CONSTRUCTION

INDUSTRIAL

MINING
(s. 170)

M.21. Junction boxes for a cable transmitting power at a potential exceeding 300 volts shall not be located in a shaft or directly attached to any timber at a shaft station or headframe.

TELEPHONE CABLES

CONSTRUCTION

INDUSTRIAL

MINING
(s. 171)

M.22. The outer jackets of signal and telephone cables in new installations in underground mines shall be of non combustion supporting material.

UNDERGROUND LIGHTING CIRCUIT

CONSTRUCTION

INDUSTRIAL

MINING
(s. 172)

M.23. The voltage of an underground lighting circuit shall not exceed 150 volts alternating current or 300 volts direct current.

UNDERGROUND TROLLEY LINES

CONSTRUCTION

INDUSTRIAL

MINING
(s. 173)

M.24. In an underground mine, trolley lines shall,

- (a) be at an elevation greater than 1.8 metres above grade;
- (b) operate at a potential not exceeding 300 volts; and
- (c) be guarded against inadvertent contact by anyone.

ELECTRICAL HAZARD IN CONFINED SPACE

CONSTRUCTION
(s. 119(8))

deleted

INDUSTRIAL

MINING

ELECTRICAL UTILITY WORK

CONSTRUCTION
(new)

INDUSTRIAL
(new)

MINING
(new)

PART VI ELECTRICAL UTILITY WORK

C.16. In this Part,

- (a) "electrical utility work" means work performed to install, modify and maintain electrical equipment and conductors rated at more than 750 volts; and
- (b) "hold-off" means a procedure to establish a method to prohibit re-energizing of apparatus or circuits under this protection;

C.17. This Part applies to electrical utility work.

- C.18. (1) Electrical utility work shall be carried out by a private or public electrical utility or an electrical utility contractor qualified to perform the work and approved by the utility.
- (2) The work shall be performed only by,
- (a) a competent person who has been designated as a journeyman-lineman by the utility, or

- 1. X. "electrical utility work" means work performed to install, modify and maintain electrical equipment and conductors rated at more than 750 volts; and
- X. "hold-off" means a procedure to establish a method to prohibit re-energizing of apparatus or circuits under this protection;

- 1. X. "electrical utility work" means work performed to install, modify and maintain electrical equipment and conductors rated at more than 750 volts; and
- X. "hold-off" means a procedure to establish a method to prohibit re-energizing of apparatus or circuits under this protection;

- I.10. (1) Electrical utility work shall be carried out by a private or public electrical utility or an electrical utility contractor qualified to perform the work and approved by the utility.
- (2) The work shall be performed only by,
- (a) a competent person who has been designated as a journeyman-lineman by the utility, or

- M.25. (1) Electrical utility work shall be carried out by a private or public electrical utility or an electrical utility contractor qualified to perform the work and approved by the utility.
- (2) The work shall be performed only by,
- (a) a competent person who has been designated as a journeyman-lineman by the utility, or

ELECTRICAL UTILITY WORK (cont'd)

CONSTRUCTION

(new)

INDUSTRIAL

(new)

MINING

(new)

(b) a competent person who has been designated as a journeyman-lineman in training by the utility and who is continuously supervised by a designated journeyman-lineman.	(b) a competent person who is continuously supervised by a designated journeyman-lineman.	(b) a competent person who is continuously supervised by a designated journeyman-lineman.
C.19. Where work is to be done on or in close proximity to energized electrical equipment or conductors operating at more than 750 volts, the work shall be carried out by workers who are adequately insulated from other energized conductors or grounded components.		
C.20. Rubber gloves, insulating blankets and other protective equipment and devices shall be adequate to protect the worker from electrical hazards and shall be dielectrically tested as recommended by the manufacturer.	(3) Rubber gloves, insulating blankets and other protective equipment and devices shall be adequate to protect the worker from electrical hazards and shall be dielectrically tested as recommended by the manufacturer.	(3) Rubber gloves, insulating blankets and other protective equipment and devices shall be adequate to protect the worker from electrical hazards and shall be dielectrically tested as recommended by the manufacturer.
C.21. Work on or in close proximity to energized electrical conductors, apparatus or equipment shall be done only under the protection of a hold-off.	(4) Work on or in close proximity to energized electrical conductors, apparatus or equipment shall be done only under the protection of a hold-off.	(4) Work on or in close proximity to energized electrical conductors, apparatus or equipment shall be done only under the protection of a hold-off.
C.22. Work in close proximity to energized electrical conductors, apparatus or equipment at the voltage specified in column 1 shall be done outside the minimum distance specified in column 2 of	(5) Work in close proximity to energized electrical conductors, apparatus or equipment at the voltage specified in column 1 shall be done outside the minimum distance specified in column 2 of	(5) Work in close proximity to energized electrical conductors, apparatus or equipment at the voltage specified in column 1 shall be done outside the minimum distance specified in column 2 of

CONSTRUCTION
(new)

INDUSTRIAL
(new)

MINING
(new)

- (a) Table I when the work is done by a worker under the supervision of a designated journeyman-lineman,
- (b) Table II when the work is done by a designated journeyman-lineman, or
- (c) Table III when the work is done using earth augers, radial boom or pole derricks.

- (a) Table I when the work is done by a worker under the supervision of a designated journeyman-lineman,
- (b) Table II when the work is done by a designated journeyman-lineman, or
- (c) Table III when the work is done using earth augers, radial boom or pole derricks.

- (a) Table I when the work is done by a worker under the supervision of a designated journeyman-lineman,
- (b) Table II when the work is done by a designated journeyman-lineman, or
- (c) Table III when the work is done using earth augers, radial boom or pole derricks.

TABLE I

TABLE I

TABLE I

Column 1 Conductor Voltage	Column 2 Minimum Distance
750 to 15,000 volts	0.6 metre
over 15,000 to 35,000 volts	0.9 metre
over 35,000 to 50,000 volts	1.2 metres
over 50,000 to 150,000 volts	1.5 metres
over 150,000 to 350,000 volts	2.1 metres
over 350,000 volts	3.6 metres

Column 1 Conductor Voltage	Column 2 Minimum Distance
750 to 15,000 volts	0.6 metre
over 15,000 to 35,000 volts	0.9 metre
over 35,000 to 50,000 volts	1.2 metres
over 50,000 to 150,000 volts	1.5 metres
over 150,000 to 350,000 volts	2.1 metres
over 350,000 volts	3.6 metres

Column 1 Conductor Voltage	Column 2 Minimum Distance
750 to 15,000 volts	0.6 metre
over 15,000 to 35,000 volts	0.9 metre
over 35,000 to 50,000 volts	1.2 metres
over 50,000 to 150,000 volts	1.5 metres
over 150,000 to 350,000 volts	2.1 metres
over 350,000 volts	3.6 metres

TABLE II

TABLE II

TABLE II

Column 1 Conductor Voltage	Column 2 Minimum Distance (journeyman-lineman)
750 to 15,000 volts	0.3 metre
over 15,000 to 35,000 volts	0.45 metre
over 35,000 to 150,000 volts	0.6 metre
over 50,000 to 150,000 volts	0.9 metre
over 150,000 to 350,000 volts	1.2 metres
over 350,000 volts	2.7 metres

Column 1 Conductor Voltage	Column 2 Minimum Distance (journeyman-lineman)
750 to 15,000 volts	0.3 metre
over 15,000 to 35,000 volts	0.45 metre
over 35,000 to 150,000 volts	0.6 metre
over 50,000 to 150,000 volts	0.9 metre
over 150,000 to 350,000 volts	1.2 metres
over 350,000 volts	2.7 metres

Column 1 Conductor Voltage	Column 2 Minimum Distance (journeyman-lineman)
750 to 15,000 volts	0.3 metre
over 15,000 to 35,000 volts	0.45 metre
over 35,000 to 150,000 volts	0.6 metre
over 50,000 to 150,000 volts	0.9 metre
over 150,000 to 350,000 volts	1.2 metres
over 350,000 volts	2.7 metres

ELECTRICAL UTILITY WORK (cont'd)

CONSTRUCTION
(new)

INDUSTRIAL
(new)

MINING
(new)

TABLE III

TABLE III

TABLE III

Column 1 Conductor Voltage	Column 2 Minimum Distance (Earth Augers, Radial Boom and Pole Derricks)	Column 1 Conductor Voltage	Column 2 Minimum Distance (Earth Augers, Radial Boom and Pole Derricks)	Column 1 Conductor Voltage	Column 2 Minimum Distance (Earth Augers, Radial Boom and Pole Derricks)
750 to 35,000 volts	0.9 metre	750 to 35,000 volts	0.9 metre	750 to 35,000 volts	0.9 metre
over 35,000 to 50,000 volts	1.2 metres	over 35,000 to 50,000 volts	1.2 metres	over 35,000 to 50,000 volts	1.2 metres
over 50,000 to 350,000 volts	3.0 metres	over 50,000 to 350,000 volts	3.0 metres	over 50,000 to 350,000 volts	3.0 metres
over 350,000 volts	6.0 metres	over 350,000 volts	6.0 metres	over 350,000 volts	6.0 metres

C.23. Installation or removal of wires in close proximity to energized conductors, apparatus or equipment shall be performed only when,

- (a) the wires being installed or removed, the machinery, equipment, vehicles and devices used to perform the work are effectively grounded;
- (b) the machinery and equipment used in installing or removing wire under tension are:
 - (i) effectively grounded and completely surrounded by a bonded ground gradient control mat;

CONSTRUCTION
(new)

INDUSTRIAL
(new)

MINING
(new)

- (ii) surrounded by a fence at least one metre in height, and;
- (iii) where the fence is composed of conductive material, it is effectively grounded;
- (c) travellers and pulleys used in the installation or removal of overhead wires are effectively grounded at each end pole and at every 5th intermediate pole;
- (d) the workers performing the work are protected by insulated protective equipment adequate to protect the worker from electrical hazards; and
- (e) protective devices have been installed to prevent the wires from falling onto a public way.

C.24. Bare hand live line work on overhead conductors shall be carried out under the protection of a hold-off and only if,

ELECTRICAL UTILITY WORK (cont'd)

CONSTRUCTION
(new)

- (a) the worker is a competent person and has been designated by the utility to perform bare hand, live line work;
- (b) insulated aerial devices are used as work platforms; and
- (c) bonding wires are attached to the same conductor bridging the work area to ensure that the conductor remains at the same potential at all times.

INDUSTRIAL
(new)

MINING
(new)

